Proposal For
Mobile Science Laboratory™
Senior Phase
Grade (7-9)

Pfunzo Ye Sive™

Suppliers Of Educational Kits

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Mobile Science Laboratory™ (MSL)

Introduction

The Pfunzo Ye Sive **Mobile Science Laboratory™** has been specifically designed and structured to address the **purpose** and **principles** as set out in the Curriculum and Assessment Policy Statement (CAPS).

As a **purpose** CAPS speaks about:"*equipping learners, irrespective of their socio-economic background, race, gender, physical ability, intellectual ability, with the knowledge, skills and values necessary for self-fulfilment and meaningful participation in society as citizens of a free country*" (CAPS Page 4 paragraph 1.3a)

As a **principal** CAPS speaks about" "*Active and critical learning; encouraging an active an critical approach to learning, rather than rote and uncritical learning of given truths*"
(CAPS Page 4 paragraph 1.3b)

The Pfunzo Ye Sive **Mobile Science Laboratory™** also addressed the cognitive thinking outlined in CAPS about how practical work must be approached namely: " *Practical work must be integrated with theory to strengthen the concepts being taught. These may take the form of simple practical demonstrations or even experiment or practical investigations*." (CAPS page 11 paragraph 2.5)

Pfunzo Ye Sive **Mobile Science Laboratory™** has firmly and successfully establish the central methods of natural and physical sciences, whereby inference from experience guides formulation of hypotheses, whose predictions are validated by experiment.

Laboratory activities in school natural and physical sciences provides experience with phenomena, a starting place for the systematic development of learners' ideas, and a testing ground for the predictive power of their reasoning. It enables learners to have the mental picture of what has been taught and to retain the message in their memory for a long time. That is what we call improvisation of learning sciences in the classroom.

Advantages of Mobile Science Laboratory™ in our school

The **MSL** is set up in such a way that the lab has:-

- adequate and convenient storage for equipment;
- each piece of equipment in the lab has a unique space so that missing items can be detected at a glance;
- a large workspace that allows for group work (4 learners);
- the included lab manuals allows for activities to happen immediately;
- it enables the learners to develop functional and manipulating skills; and
- it enables the learner to develop problem solving skill and encourages scientific attitude.

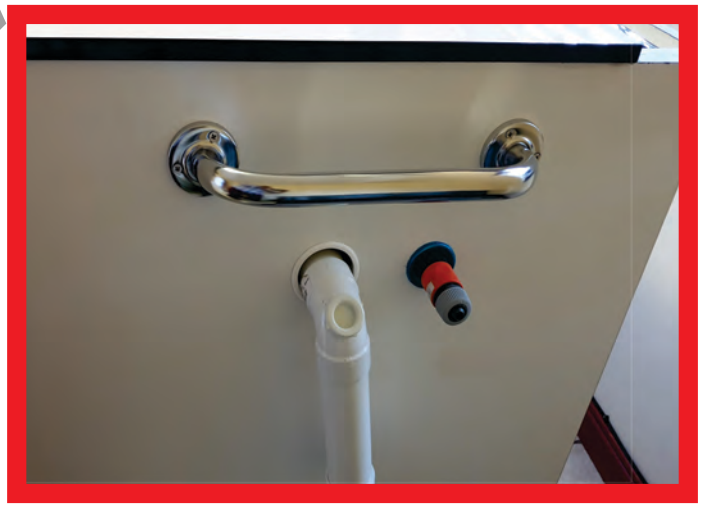
What Mobile Science Laboratory™ do for our learners

Activities are designed to engage learners' minds, so that learners acquire skill and confidence in their:

- measurement of physical quantities with appropriate accuracy;
- recognition of factors that could affect the reliability of their measurements;
- Manipulations of materials, apparatus, tools, and measuring instruments;
- Clear descriptions of their observations and measurements;
- Representation of information in appropriate verbal, pictorial, graphical, and mathematical terms;
- Inference and reasoning from their observations;
- Ability to rationally defend their conclusions and predictions;
- Effective and valued participation with their peers and the teacher in a cooperative intellectual enterprise; and
- Articulate reporting of observations, conclusions, and predictions in formats ranging from:
    - ⇒ informal discussion to a formal laboratory report; and
    - ⇒ ability to recognize those questions that can be investigated through experiment and to plan, carry out, evaluate, and report on such experiments.

Mobile Science Laboratory™ (MSL) Unit Structure

- The Solid wood and acid proof unit is ideal for mobility, long lasting, durability.
- Solid industrial fitted wheels to go on any surface with ease.
- Two stainless steel handles to pull or push around an area.
- Five pull out drawers that store all glassware and other smaller items..
- Two pull out cooling drawers that store the chemicals for experiments.
- Pigeon hold spaces for box and bigger item storage.
- Long flat space to store maps, charts and longer instruments.
- There is a pull up rear board set on ball bearing rails for easy usage by any average adult, which is made to write with white board makers and can be used as a projector screen.
- Two lock up and closed doors makes it ideal for safety and concealment of items.
- Senior Phase units come with a stainless-steel tap and sink for water and washing items.
- Inlet pipe is made with durable hose fitting making it easy to contact in any space and class through a garden or bathroom tap.
- Outlet is made of half inch pvc pipe and drops at an angle of 90 degrees into a 25liter bucket.
- Dimensions of the unit are 1200 x 900 x 1100:
    - ⇒ 2 White Melamine Board
    - ⇒ 1 White Iceberg Gloss Board
    - ⇒ 1 White Masonite
    - ⇒ 4 Ball-Bearing Runners and 4 Rubber Wheels
    - ⇒ 4mm Edging Strip and 2mm Edging Strip Potty Hinges
    - ⇒ Chip Board Screws and Door Handles Steel Bar and 2 Side Heavy Duty Handles
    - ⇒ White Self-Stick Screw Cap
    - ⇒ P.V.C Pipe
    - ⇒ Deep Round Single Bowl Zink, Tap, Flexi Pipe
    - ⇒ Valves
    - ⇒ Bolt sand Nuts
    - ⇒ Drawer lock n Shooter
    - ⇒ L/Shape Waste Pipe
    - ⇒ Side Boards - 1200 × 610 and 830 × 690
    - ⇒ Top Surface - 1162 × 705
    - ⇒ Floor Panel - 1168 × 580
    - ⇒ Pull Up Board - 624 × 580
    - ⇒ Pigeon Holes - 178 × 580
    - ⇒ Long Panel - 678 × 70
    - ⇒ Chemical Drawers - 95 × 1168
    - ⇒ Drawers - 70 ×1168
    - ⇒ Doors - 834 × 598
    - ⇒ Side Panels - 840 × 1174
- The handles made of stainless steel with ball bearing running rails which are used to pull out and made to last for a longer life span.



Mobile Science Laboratory™ Unit Content – Senior Phase

Chemicals

- ⇒ Bean seeds
- ⇒ Flower seeds
- ⇒ Yeast
- ⇒ Jelly Powder
- ⇒ Samp
- ⇒ Calcium Carbonate
- ⇒ Magnesium powder
- ⇒ Tea bags
- ⇒ Clay
- ⇒ Sugar
- ⇒ Salt (coarse)
- ⇒ Salt (fine)
- ⇒ Iron fillings
- ⇒ Candles
- ⇒ Lemon juice
- ⇒ Food colouring
- ⇒ Methylated spirit
- ⇒ Potassium permanganate
- ⇒ Vinegar
- ⇒ Bicarbonate of soda
- ⇒ Fizzy drink
- ⇒ Liquid soap
- ⇒ Tartaric acid
- ⇒ ENO
- ⇒ Litmus paper
- ⇒ Litmus paper
- ⇒ Milk powder
- ⇒ Shampoo

General Lab and Glassware

- ⇒ Beakers
- ⇒ Measuring cylinder
- ⇒ Conical Flask
- ⇒ Syringes
- ⇒ Droppers
- ⇒ Test tubes
- ⇒ Test-Tube holder
- ⇒ Test-tube rack
- ⇒ Petri-dish
- ⇒ Evaporating dish
- ⇒ Liebig condenser
- ⇒ Watch glass
- ⇒ Funnel
- ⇒ Pippete

- ⇒ Spoons
- ⇒ Spirit lamp
- ⇒ Drinking straws
- ⇒ Filter paper
- ⇒ Gloves- latex
- ⇒ Brush
- ⇒ Wood
- ⇒ Stone
- ⇒ Sieve strainer
- ⇒ Tripod
- ⇒ Gauze

Science

- ⇒ Copper wire with crocodile clips
- ⇒ Magnets (NS)
- ⇒ Horse-Shoe
- ⇒ Plug
- ⇒ Musical Instrument
- ⇒ Drawing pins
- ⇒ Candle wax
- ⇒ Switches
- ⇒ Torch
- ⇒ Cell holders
- ⇒ Cells/batteries
- ⇒ Glass jars
- ⇒ Stoppers
- ⇒ Cardboard
- ⇒ Rubber (eraser)
- ⇒ Brick
- ⇒ Bulbs
- ⇒ Bulb holder
- ⇒ Magnifying glass
- ⇒ Motors
- ⇒ Buzzers
- ⇒ Dynamo
- ⇒ Steel rods
- ⇒ Brass rods

Astronomy

- ⇒ Rock and mineral set
- ⇒ Earth ball
- ⇒ Moon and Earth model
- ⇒ Orbiter

Measuring Apparatus

- ⇒ Measuring tape
- ⇒ Rulers

- ⇒ Stopwatch
- ⇒ Thermometers
- ⇒ Mathematical set of instrument
- ⇒ Spatula

Miscellaneous

- ⇒ Colouring pens
- ⇒ String
- ⇒ Scissors
- ⇒ Water trough
- ⇒ Paper
- ⇒ Glue
- ⇒ Black ink + pad
- ⇒ Polystyrene
- ⇒ Koki colours
- ⇒ Aluminium foil dishes
- ⇒ Aluminium foil
- ⇒ knives
- ⇒ Forks
- ⇒ Matches
- ⇒ Rubber bands
- ⇒ Small Soccer balls
- ⇒ Tooth picks
- ⇒ Magnesium Ribbon
- ⇒ Plaster of paris
- ⇒ Play Dough
- ⇒ Paper Plates
- ⇒ Paper Cups
- ⇒ Paper Fasteners

Learning and Support Material

- ⇒ Charts
  - o Acid colour indicator
  - o Periodic table
  - o Electricity
  - o Food Packaging Labels

- ⇒ Teacher Manual
- ⇒ Learner Manual
- ⇒ Laboratory Safety Datasheet Manual

Folding Tape Measure

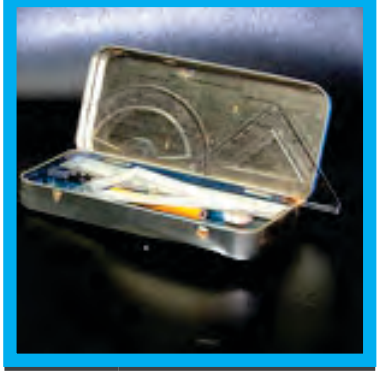
Digital Stop watch

Kitchen Scale - Digital

Double beam balance

Ammeter

Mathematics Set



Test tube 24mm

Graduated pipette

Glass Funnel

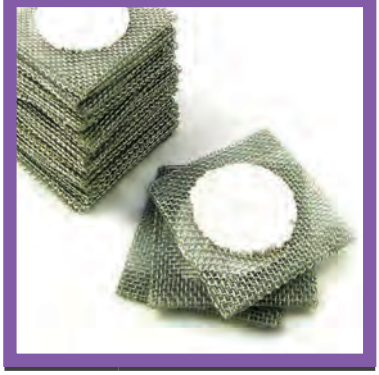
Glass funnel long stem

Burette clamp

Cylinder brush

Latex gloves

Gauze Flat form



Syringes

Lense Set

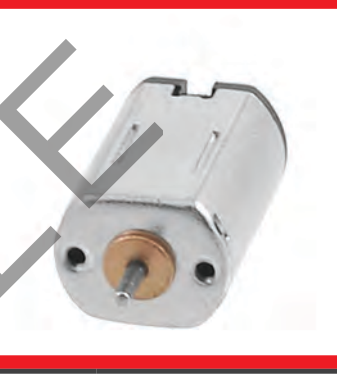
Biconvex Lens - Acrylic
Biconcave Lens - Acrylic

Straight filament bulb

Magnifying glass

Magnetic needle

Motor



Electric flex wire

Crocodile clip

Compass

Rock & Mineral Set

Test strips

Sugar

Tartaric acid

Methylated spirit

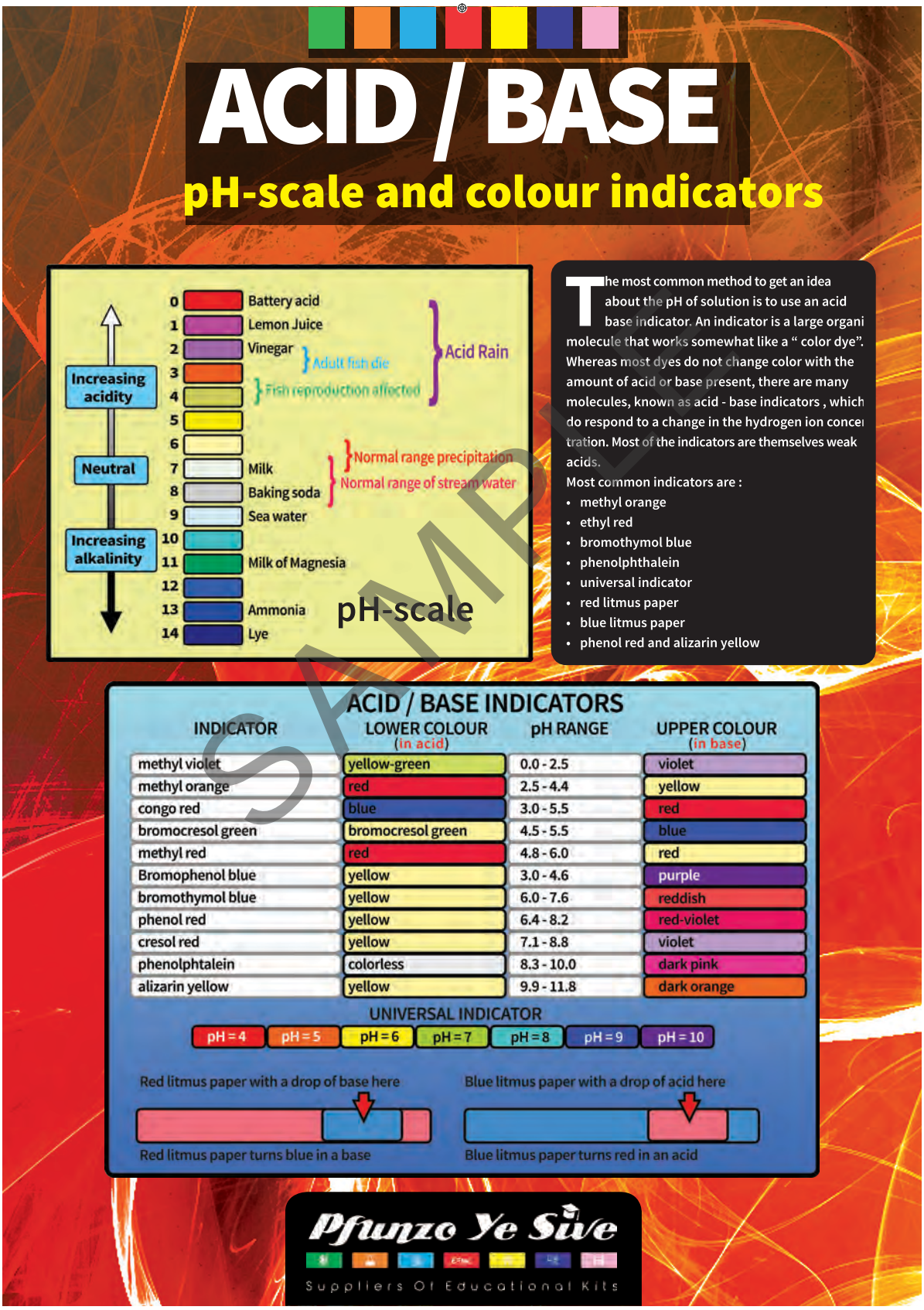
Iron nails

Dissecting scissors

Trimming knife

Masking tape

Acid / Base Chart



Cold Drink Chart

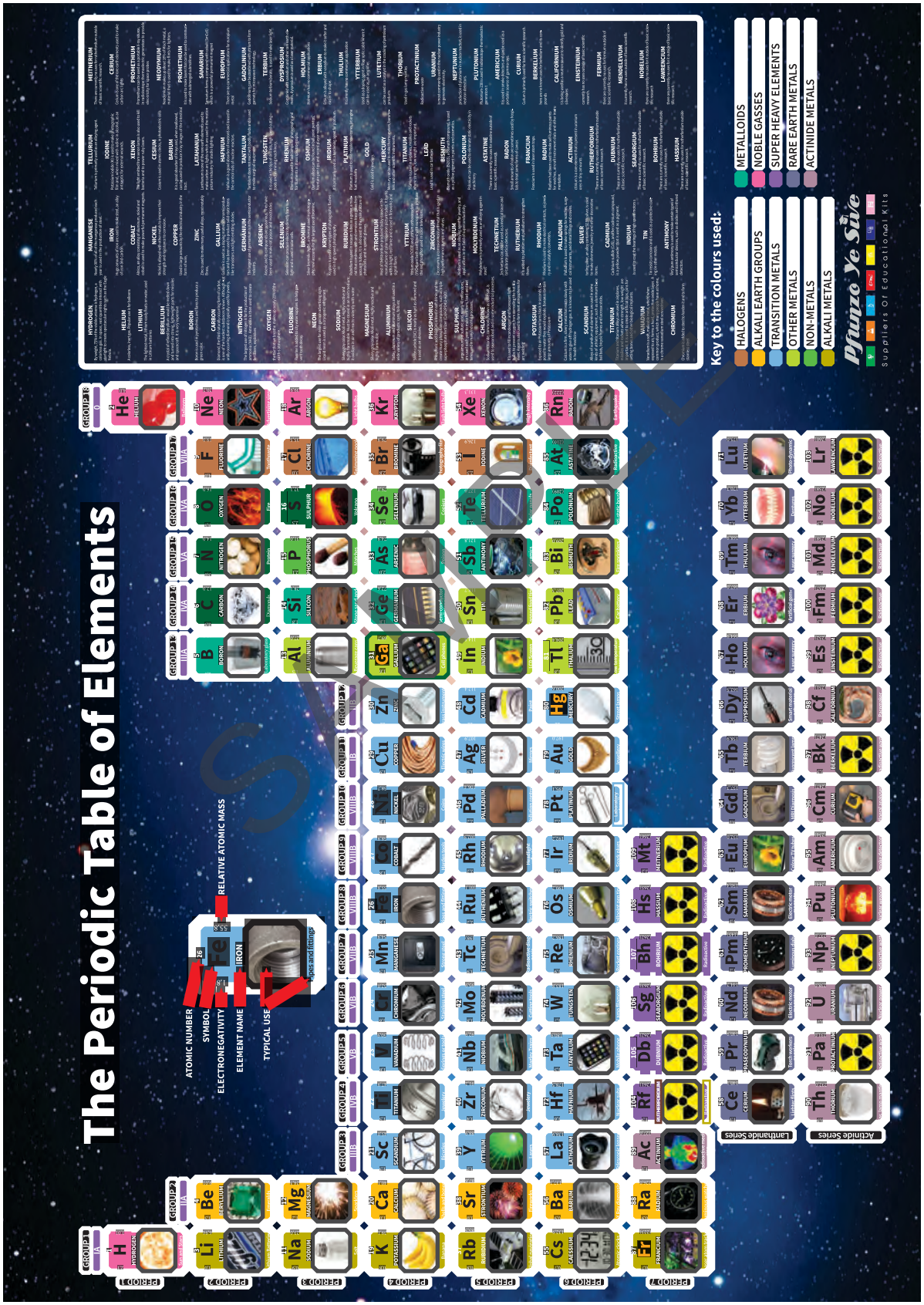
INGREDIENTS: Carbonated water, sugar, citric acid, stabilizers, preservatives (Sodium benzoate and potassium sorbate), flavouring

Nutrition Facts

Single serving size: 250g

	Per 100 g	Per single serving
Energy (kJ)	202	504
Protein (g)	0	0
Glycaemic Carbohydrate (g) of which total sugar (g)	12 11.8	29 29.4
Total fat (g) of which saturated fat (g)	0 0	0 0
Dietary fibre (g)	0.5	0.3
Total Sodium (mg)	0	0
Nutritional information of a typical soft drink as bottled		

Periodic Table of Elements Chart



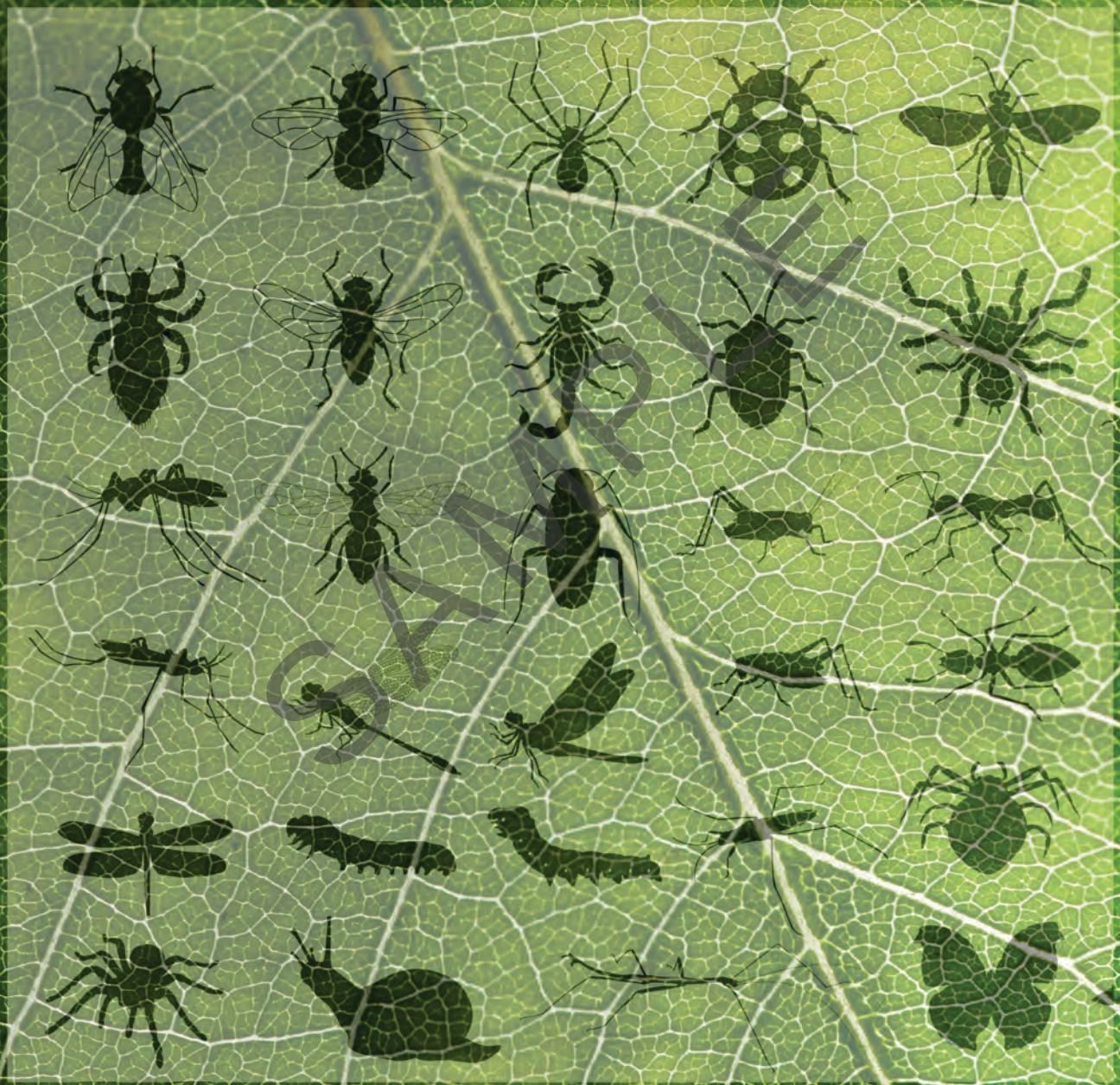
Teacher Manual – Senior Phase

- The Teacher Manual was designed with CAPS specifications and experiments that are visible and practical for daily teaching.
- Each **MSL** contains a CAPS aligned Teacher Manual to assist the teacher to provide a conducive learning experience to the class.
- The Teacher Manual has been developed to support the content (knowledge, concepts and skills) contained in the National Curriculum Statement (NCS), as organised in the new Curriculum and Assessment Policy Statement (CAPS).
- The Teacher Manual has been organised to support teaching and learning in the classroom by presenting the material to be taught and practised in the classroom in discrete lessons.
- 1 x Teacher – 297 x 210.

TEACHER'S MANUAL

Natural Science

Senior Phase



Pfunzo Ye Sive

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NATURAL SCIENCES
GRADE: 7-9
EDUCATOR'S MANUAL

Pfunzo ye Sive
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Contents

To the teacher

The manual contains demonstrations, investigations and worksheets based on the following strands:

- **Life and Living**
- **Matter and Materials**
- **Energy and Change**
- **Planet Earth and Beyond**

All the activities are based on the CAPS documents for grades 7 – 9

Manner of teacher demonstration

The teacher is expected to mediate demonstrations through large groups such as the whole class and small groups of 7 – 9 learners, resources permitting.

Learner participation

According to the spirit of CAPS, learners are expected to learn through:

- **Observations**
- **Active involvement including doing the actual activities.**
- **Collaborative and cooperative learning through group work.**

The layout of the activities (demonstrations, experiment and worksheets) is meant to afford the learners varied learning contexts that recognise that learners have different learning styles and preferences.

It is expected that the teacher guides the learners through the work and avoids giving solutions before they have tried the work on their own.

Each strand has prescribed experiments, investigations and demonstrations as well as worksheets activities that may be done by learners as individuals or in small groups of 7 – 9 learners. All these activities should be assessed by the teacher, peer or learner.

About the equipment in the kit

➢ Grouping of learners

For the grades 7– 9 it is advisable for the teacher to use the whole-class demonstration strategy so that every learner is attentive as well as avoid accidents. As for grades 7– 9, learners may be allowed to work in small groups.

➢ Safe keeping of equipment

It is best to keep the equipment in the provided container in its original packaging. The equipment should be cleaned after each use and made ready for the next demonstration.

➢ Planning of practical work.

The teacher should go through the activity and actually do it before hand. This should allow the teacher to create model answers and responses to activities that inform and guide the lesson roll out.

How to use the activity sheets

➢ Photocopy rights

The teacher is allowed to copy the activities for his/her class only.

Controlling the kit

➢ Storage

Safe storage of equipment is important due to its high cost and the need for reuse.

➢ Stock control

After each activity, the teacher should check against inventory when collecting back apparatus from learners. Broken material should be recorded and disposed of properly. Liquids should be placed in containers- organics and aqueous solutions in separate containers and NEVER down the drain.

GRADE: 7

STRAND: **LIFE & LIVING**

TERM: 1

ACTIVITY 1: The Biosphere

AIM: To investigate conditions required for germination of seeds.

NOTES

- Ask learners to bring containers to class.
- Provide leaners with seeds.
- Stress the need to measure the heights of the seedlings for use in Activity 2.

PRIOR KNOWLEDGE

1. Learners should understand that life is sustained by energy, gases, water, soil and favourable temperature.

Answers to follow up Questions

1. Moisture.
2. Warm temperature and soil.

ACTIVITY 2: The Biosphere

AIM: To investigate conditions required for growth of seedlings.

NOTES

- Remind learners to use measurements starting from those obtained during Activity 1.
- Provide them with tape measures.

PRIOR KNOWLEDGE

1. General knowledge of feeding, growth, reproduction, respiration, excretion and locomotion of living organisms.

Answers to follow up Questions

1. Initially almost the same but the cupboard ones become taller, thinner and yellowish.
2. Sunlight and moisture.
3. Warm temperature

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 1: Physical and Chemical Change

AIM: To represent the structure and composition of compounds.

MATERIALS

- ice
- beakers
- burner
- thermometer,
- stop watch

SAFETY PRECAUTION
1. Spirit is highly flammable and must be handled with care.

METHOD

- Place some ice in a beaker.
- Measure the temperature of the ice and record it.
- Heat the ice and after 1 minute measure the temperature again and record it. Repeatevery minute, until at least 10 minutes after the ice has melted.
- Record the values of temperature after every 1 minute.
- Plot a graph of time versus temperature for the heating of ice.

Observations

Write down the observations in point form.

Table of Results.

time/ - (s)	0	1	2	3	4	5	6	7	8	9	10
Temperature (^{o}C)											

Questions

1. Plot a graph of temperature vs time and join the points using a smooth curve.
2. Is water an element or a compound. Give a reason for your answer.
3. Is melting of ice a chemical or physical change?

SOLUTIONS

1. results
2. compound,there are two elements chemically combined together.
3. Physical

ACTIVITY 2: Separating mixtures.

AIM: To separate the mixture of salt, water and spirit.

MATERIALS

- Burners
- beaker
- distillation column
- Elernmeyer flask

SAFETY PRECAUTION
2. Take care since heat will be used.

METHOD

- Mix the three substances in a conical flask.
- Heat the solution strongly and collect the methylated spirit first sand then were and the solid salt particles that remain behind.

Follow up Question

1.1 What property of water enables it to be separated from methylated spirit?

1.2 What process is used to separate water and salt**?**

Solutions

1.3 solubility

1.4 evaporation

ACTIVITY 3: Separating mixtures.

AIM: To separate an ink dot into separate colours.

MATERIALS

- Beaker
- glass road
- water
- ink
- filter paper

METHOD

- Mark a dot on filter paper using black ink
- Suspend the filter paper vertically and allow the remaining half of the paper to be immersed in water.
- Make observations

Questions

1. Is chromatography a physical/chemical change?

SOLUTIONS

1. physical

ACTIVITY 4: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- tea
- coffee
- milk
- fruit juices
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- phenolphthalein indicator.

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A and B.
- Use a medicine dropper to drop three drops of Universal indicator in test tube A and record the colour changes.
- Use a medicine dropper to drop three drops of Universal indicator in test tube B and record the colour changes.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Follow up Questions

1.1. Define an acid.

1.2 State three properties of an acid.

1.3 Define an alkali.

1.4 State two properties of an alkali. form the results, identify the acids and the alkalis.

SOLUTIONS

1.1 a substance whose pH is below 7

1.2 sour taste, corrosive, pH below 7

1.3 a substance whose pH is above 7

1.4 soapy feel, sour taste

ACTIVITY 5: Acids and Bases.

AIM: To test and classify household beverages as acids or alkaline.

MATERIALS

- tea
- coffee
- milk
- fruit juices
- fizzy drinks

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A.
- Test using a separate litmus paper ,blue and red by dipping about 1cm of the paper.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Follow up Questions

- Define an acid.
- State three properties of an acid.
- Define an alkali.
- State two properties of an alkali.
- Form the results, identify the acids and the alkalis.

SOLUTIONS

1.1 a substance whose pH is below 7
1.2 sour taste, corrosive, pH below 7
1.3 a substance whose pH is above 7
1.4 soapy feel, sour taste
1.5 use results

ACTIVITY 6: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- red litmus paper
- blue litmus paper.

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A.
- Test using a separate litmus paper, blue and red by dipping about 1cm of the paper.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Follow up Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.
5. Form the results, identify the acids and the alkalis.

SOLUTIONS

1.1 a substance whose pH is below 7

1.2 sour taste, corrosive, pH below 7

1.3 a substance whose pH is above 7

1.4 soapy feel, sour taste

1.5 use results

Term 3

STRAND: ENERGY & CHANGE

ACTIVITY 1: Conversion of mechanical energy to other forms

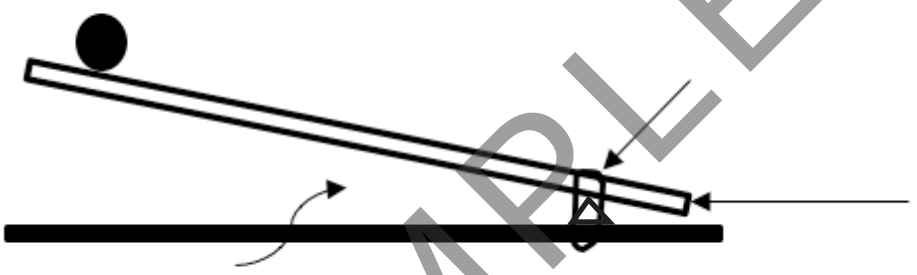
AIM: To investigate the conversion of energy using mechanical systems

Materilals:

- Perspex rod
- Rubber band
- Fulcrum
- Polystyrene ball

Safety Caution:
Do not direct the catapult towards other learners. Stay clear of the path of the polystyrene ball!

Method



- Assemble the apparatus as shown in diagram.
- Put the rubber band into the slits on the board and make two turns.
- Pull one turn of the rubber band and pass through the Perspex rod.
- Support the Perspex rod on the fulcrum.
- Push the free end of the Perspex downwards and place a polystyrene ball on it.
- Release the free end and watch the ball fly away.
- Record the distance covered by the ball.
- Put the Perspex rod through 2 two turns and repeat steps 4 to 7.

Precautions:

Do not direct the catapult towards other learners. Stay clear of the path of the polystyrene ball!

Results

Number of Turns	Distance covered(m)
1	2 - 4
2	+ 5

Conclusion

The distance covered by the polystyrene ball is directly related to the number of turns. The stored energy in the rubber band is converted to motion of the ball.

ACTIVITY 2: Conversion of mechanical energy to other forms

AIM: To investigate the conversion of potential energy using mechanical systems such as a scissors

Materials:

- Scissors
- Newspaper

Method

- Cut through 2 pages of a newspaper and observe the extent of pressure required.
- Repeat step 1 for 4, 6 and 10 pages.
- Record your observation.

Observation

No of pages	Ease of cutting
2	Very easy
4	Easy
6	Difficult
10	Very difficult

Conclusion

ACTIVITY 3a: Energy Transfer In Thermal Systems.

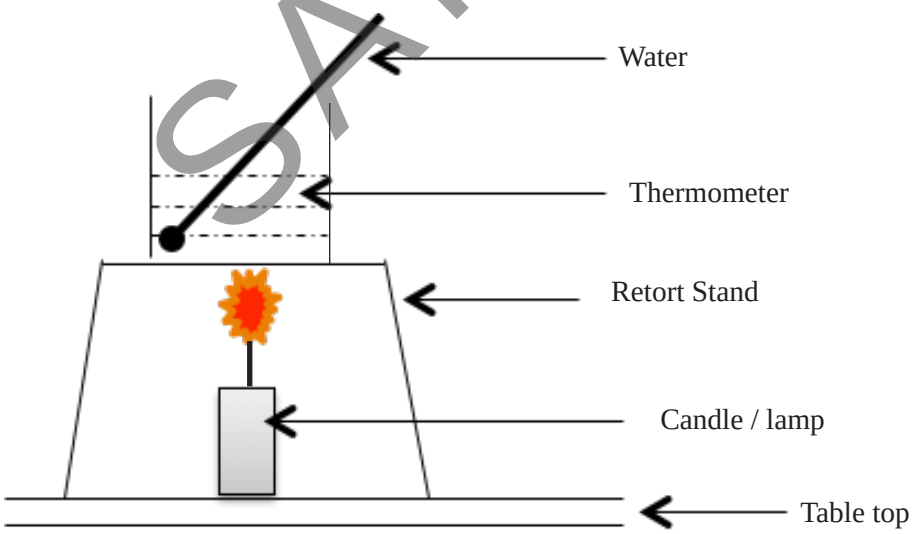
AIM: To investigate energy transfers using thermal systems.

Materials:

- Candle / burner
- Matches
- 250 ml Beaker x 2
- Thermometer
- Water
- Retort stand

Safety Caution: Teacher should ensure that safety requirements are observed and that learners are not left unattended.

Method



- Step the apparatus as shown in diagram and use 10ml of water
- Record the initial temperature of water.
- Heat the water for 10 minutes and record temperature of the water every 2 minutes.
- Plot graph of temperature versus time

Results

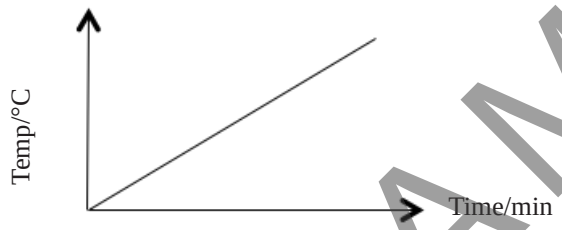
Time / min	Temperature of water / °C
0	
2	
4	
6	
8	
10	

Caution:

Teacher should ensure that safety requirements are observed and that learners are not left unattended.

Discussion

Water temperature increases with time as shown by the graph. The graph should have a general shape a follows:



Therefore energy is transferred from the candle / burner as heat and recorded as a temperature rise of the water.

Conclusion

Burning objects or fire transfers heat to the environment.

ACTIVITY 3b: Energy transfer in thermal systems:

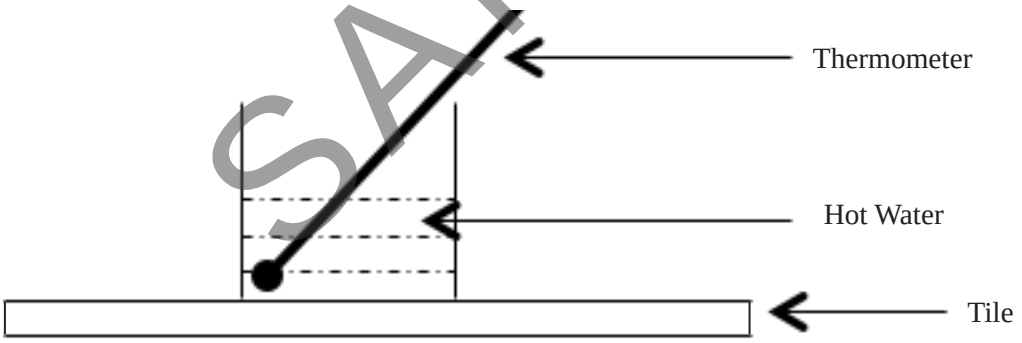
AIM: To investigate energy transfers in thermal systems.

Materilals:

- Bean Seed or tuft of grass
- 250 ml Beaker
- Thermometer
- Hot Water
- Tile

Safety Caution: Teacher should ensure that safety requirements are observed and that learners are not left unattended.

Method



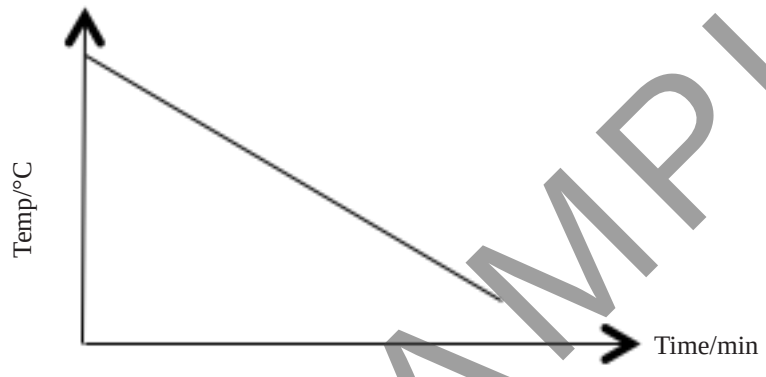
- Set up the apparatus as shown in diagram
- Record the initial temperature of water.
- Heat the water with a burning bean seed or a tuft of grass.
- Record temperature of the water every 2 minutes.
- Plot graph of temperature versus time

Results

Time / min	Temperature of water/°C
0	
2	
4	
6	
8	
10	

Discussion:

Heat is transferred to the surroundings and this loss is shown as a decrease in water temperature with time. The graph is as follows:



Therefore energy is transferred from the water as heat and recorded as a temperature decrease of the water.

Conclusion

Hot objects transfer heat to the environment.

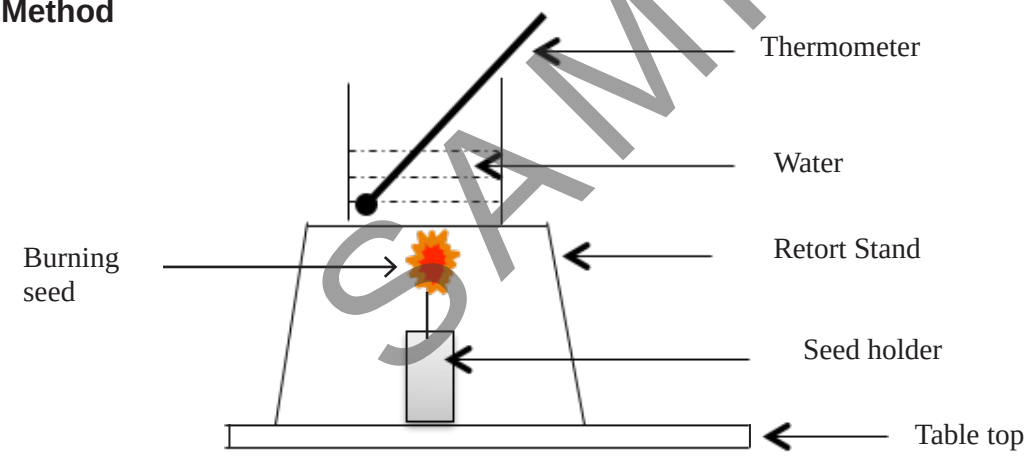
ACTIVITY 3c: Energy transfer in biological systems.

AIM: To investigate energy transfers using thermal systems.

Materilals:

- Bean seed or tuft of grass
- Matches
- 250 ml Beaker
- Thermometer
- Water
- Retort stand

Method



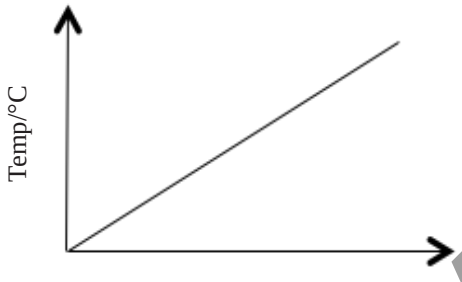
- Step the apparatus as shown in diagram
- Record the initial temperature of water.
- Heat the water for 10 minutes and record temperature of the water every 2 minutes.
- Plot graph of temperature versus time
- Repeat with a tuft of grass

Results

Time / min	Temperature of water/°C
0	
2	
4	
6	
8	
10	

Discussion:

Water temperature increases with time and graph will as follows:



Therefore energy is transferred from the seed or grass as heat and recorded as a temperature rise of the water. Relate to the conversion of food to energy by our bodies.

Conclusion

Biological systems have stored energy that can be transferred to other forms such as heat.

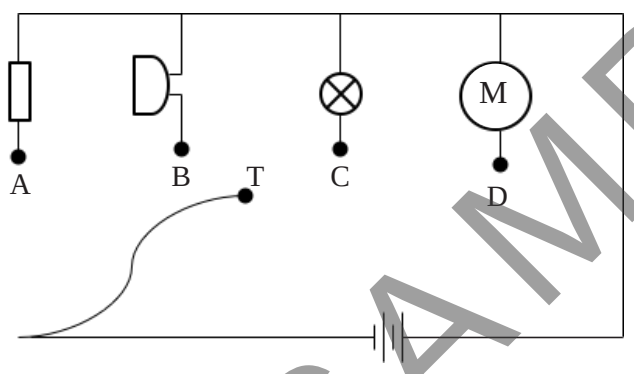
ACTIVITY 4: Energy transfer in electrical systems.

AIM: To convert electricity to Heat, sound, light and motion

Materials:

- Battery + holder
- Fan / Motor
- Light bulb + holder
- Buzzer
- Resistor
- Wire leads

Method



A= Resistor

B=Buzzer

C=Lamp

D=Motor

- Assemble the apparatus as shown in diagram above.
- Connect terminal T to A for at least 1 minute and touch the resistor.
- Record the observation.
- Connect the terminal T to B and record observation.
- Repeat step 4 for points C and D

Results

Component	Observation
Resistor	Becomes hot
Buzzer	Gives a buzz sound
Lamp	Lights up
Motor	Turns.

Conclusion

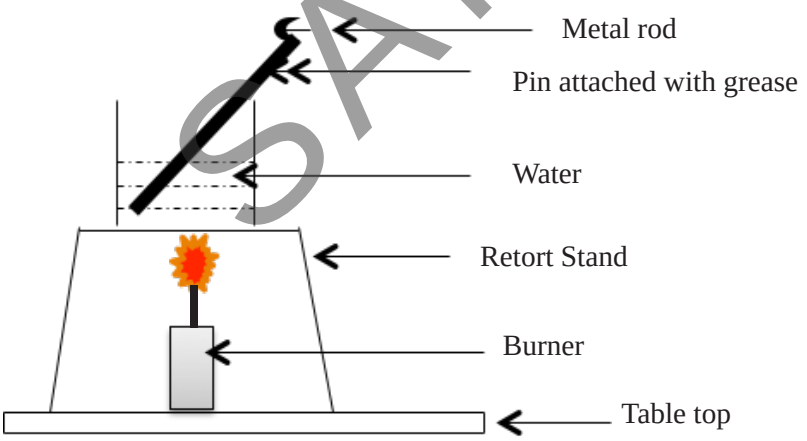
ACTIVITY 5: Heat conduction using various materials

AIM: To investigate energy transfers using thermal systems

Materials:

- Spirit or Bunsen burner
- Metal rods(steel, aluminium, copper, brass and iron) of same dimensions
- Non –metal rods (plastic, wood, Styrofoam)
- Grease / Vaseline
- Drawing pin
- Water bath
- Stop watch / cellphone with stop watch/ wrist watch with second hand

Method



- Step the apparatus as shown in diagram and heat the water bath to at least 70°C
- Record the time taken for the pin to fall off
- Repeat for other metals and the non-metals
- Draw bar graph to show the results

Results

Metal	Time for pin to fall off/ seconds
Steel	
Iron	
Copper	
Brass	
aluminium	
wood	
plastic	
Styrofoam	

Discussion

The pin will fall off the metals because they are good conductors. The metals will conduct heat easily in the following order: Aluminium, copper, brass, steel and iron. Wood, plastic and Styrofoam will not conduct heat and the pin will not fall off.

Conclusion

Metals are conductors of heat while non-metals are non-conductors.

ACTIVITY 6: Investigation of convection currents in water

AIM: To determine convection currents in water.

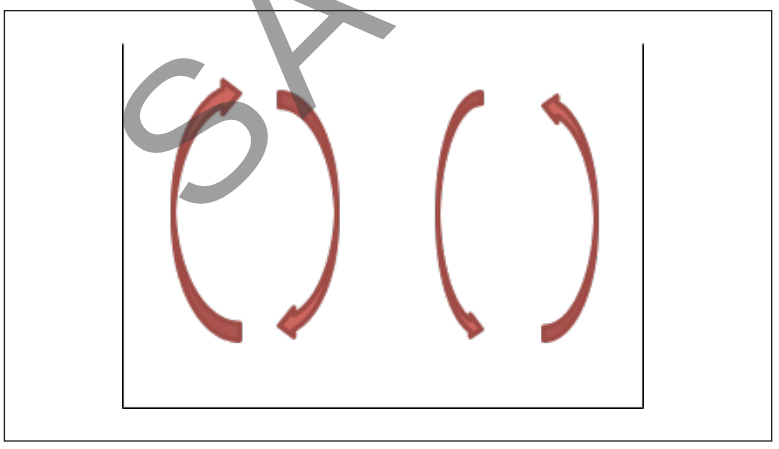
Materials:

- Beaker
- Water
- Potassium permanganate crystals/food colouring
- Bunsen or spirit burner

Method

- Drop a few potassium permanganate crystals into water in a beaker
- Heat the water and make observation.
- Draw the path followed by the colour

Observations



Discussion

The potassium permanganate dye is seen moving from the bottom of the beaker to the top and back in a definite path. The process speeds up as temperature of the water increases. The movement of the dye represents convection currents in the water.

Conclusion

Water creates convection currents when heated.

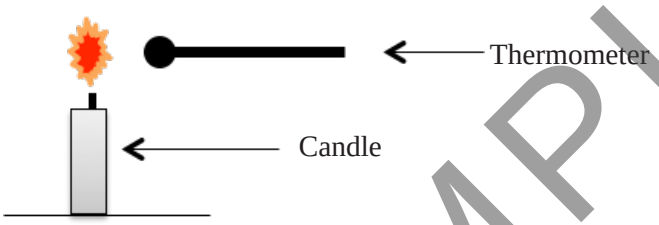
ACTIVITY 7: Heat transfer through radiation.

AIM: To investigate heat transfer through radiation by candle light.

Materilals:

- Candle
- Thermometer
- Ruler

Method



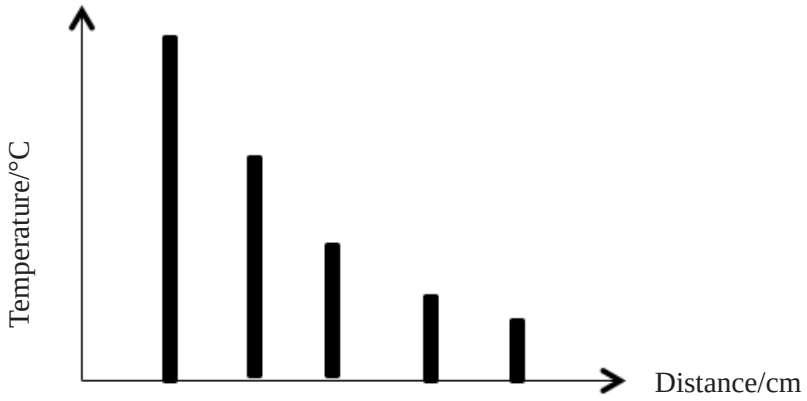
- Record the initial temperature before bringing the thermometer next to the burner.
- Place the thermometer 1 cm away from the candle as shown in diagram
- Record the temperature record the new temperature after 1 or 2 minutes.
- Repeat steps 2 and 3 for 2, 3, 4 and 5 cm
- Draw a bar graph show radiation as distance from candle increases

Results

Distance from candle/cm	Temperature/°C
1	
2	
3	
4	
5	

Discussion:

The thermometer will record decreasing temperature as the distance from the burner increases. The bar graph should show an inverse relationship between distance and temperature. The graph should be as follows:



Relate this observation to use of radiant heat sources as heaters.

Conclusion

Heat can be transferred by radiation.

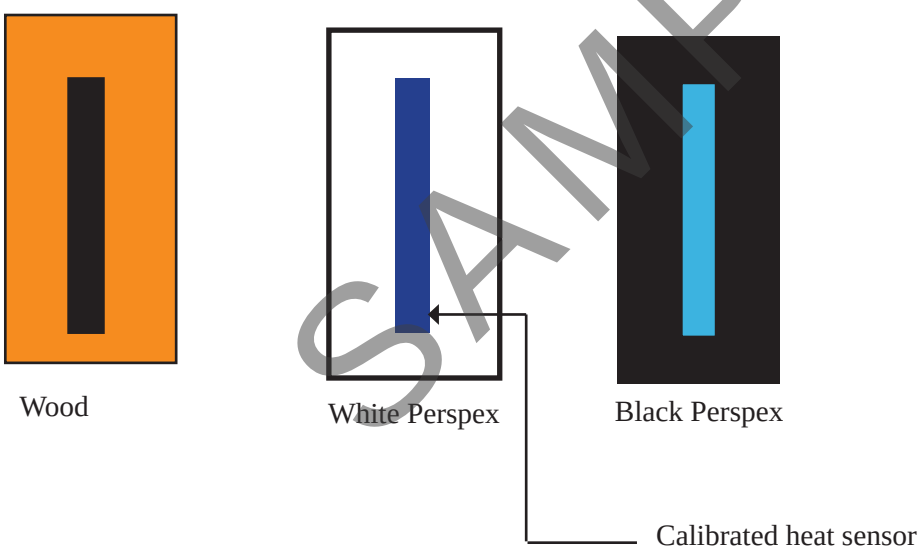
ACTIVITY 8: Investigating the amount of radiant heat absorbed by surfaces

AIM: To investigate the absorption of heat energy by different surfaces.

Materilals:

- 5 x Calibrated heat sensing strips / soft margarine
- Wood board
- Perspex white board
- Perspex black board
- Shiny metal bar(may covered with aluminium)

Method



Method

- Attach the calibrated heat sensor strips to the boards as shown above.
- Place the boards under the sun
- Record temperature readings after 20 minutes.
- Draw a line graph to show the results.

(In the absence of calibrated sensor strips, the alternate method will involve:

Putting a small dab of margarine on each strip and noting the times each will melt.)

Results

Material	Temperature(°C)
Wood	
White Perspex	
Black Perspex	
Shiny surface	

Discussion

Dark surfaces absorb heat more than shiny surfaces. The black Perspex surface will record the highest temperature value compared to other surfaces.

Conclusion

Black surfaces absorb more heat than shiny ones. Wood absorbs heat slowly.

ACTIVITY 9a: Investigating various insulating materials

AIM: To investigate how well non-metals prevent heat loss.

Materials:

- Styrofoam cups
- Plastic container
- Glass container / beaker
- Tin
- Thermometer
- Hot water
- watch

Method

- Place hot water at 70°C into each container
- Place a thermometer in each container
- Record temperature after 20 min
- Arrange the materials in terms of their insulating capabilities

Results

material	Temp after 20 min	Insulating capability
Styrofoam cups		Very good
Glass container		poor
Plastic container		good
tin		poor

Discussion

Tin is a good conductor of heat and therefore a poor retainer of heat. Glass is also a conductor of heat but less than tin. Plastic and Styrofoam are good insulators.

Conclusion

Non-metals are good insulators of heat.

ACTIVITY 9b: Investigating various insulating materials

AIM: To investigate how well non-metals prevent heat gain.

Materials:

- Styrofoam cups
- Plastic container
- Glass container / beaker
- Tin
- Tin wrapped with newspaper
- Thermometer
- Ice
- watch

Method

- Place an equal amount of ice blocks in each container
- Place a thermometer in each container
- Record temperature after 20 min
- Arrange the materials in terms of their insulating capabilities

Results

material	Temp after 20 min	Insulating capability
Styrofoam cups		Very good
Glass container		poor
Plastic container		good
tin		poor
Tin wrapped with newspaper		good

Discussion:

Styrofoam, newspapers and plastic container prevent heat gain and therefore are good insulators.

Conclusion

Non-metals are good at preventing heat gain.

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 1: To show separation processes in mineral processing.

AIM: To show separation processes in mineral processing.

MATERIALS

- Beaker
- sieve
- small stones and sand

Method:

- Load the sieve with the sand and stones.
- Agitate it and allow small particles to pass through.

Questions

1. Is the separation method a physical/chemical change

GRADE: 8

STRAND: **LIFE & LIVING**

TERM: 1

ACTIVITY 2: Content of Carbon dioxide in exhaled air.

AIM: To test for carbon dioxide in exhaled air.

NOTES

- Prepare fresh lime water by adding 1g $Ca(OH)_2$ in 500ml water in a stoppable container. Tightly stopper the container and vigorously shake for not less than 5 minutes.
- Centrifuge or alternatively leave overnight for undissolved solid to settle.
- Distribute the clear solution to learners in class.

PRIOR KNOWLEDGE

1. Learners should be familiar with the terms; inhale, exhale, respiration, products of respiration.
2. Warn learners to avoid drinking limewater when inhaling.

Answers to Follow up Questions

1. Lime water turns very milky upon exhaling and a tinge of milkiness upon inhaling.
2. Presence of carbon dioxide turns limewater milky.
3. Exhaled air contains a relatively high concentration of carbon dioxide especially if you compare with inhaled air.

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 2:

AIM: To demonstrate and record observations of how potassium permanganate decomposes into elements by heating

MATERIALS

- Potassium permanganate ($KMnO_4$) solid
- A Bunsen burner
- A test tube (pyrex)
- A test tube holder
- A wooden splint
- Matches

METHOD

- Put a spatula of potassium permanganate in the boiling tube.
- Hold the tube with a test tube holder and heat the potassium permanganate. Move the tube in and out of the flame. Use a lighted splinter to test for the gas.
- Record what you observe.

Follow up Questions

1. Write down the symbols of the elements found in the compound potassium permanganate.
2. How do you know that there has been a chemical reaction?

SOLUTIONS

1. K , Mn, O
2. There was colour change, a gas was produced and large amounts of heat energy was given out.

Term 3

STRAND: ENERGY & CHANGE

ACTIVITY 1: Friction And Static Electricity

AIM: To investigate the effect of charges created by rubbing materials.

Materials:

- Nylon or silk cloth
- Plastic or Perspex Ruler
- Pieces of tissues paper
- Saw dust

Method

- Rub the Perspex or plastic ruler with a nylon or silk cloth
- Bring the ruler next to the pieces of tissue paper or saw dust
- Observe what happens and describe in terms of same or opposite charges

Results

	Attracts paper (YES/NO)	Attracts Sawdust (YES/NO)	Charge same (YES/NO)
Plastic Ruler rubbed with nylon			
Plastic Ruler rubbed with silk			
Perspex Ruler rubbed with nylon			
Perspex Ruler rubbed with silk			

Discussion:

Charged objects will attract uncharged pieces of paper and saw dust. It will be difficult to tell the nature of charges on the objects.

Conclusion

Rubbed materials are charged.

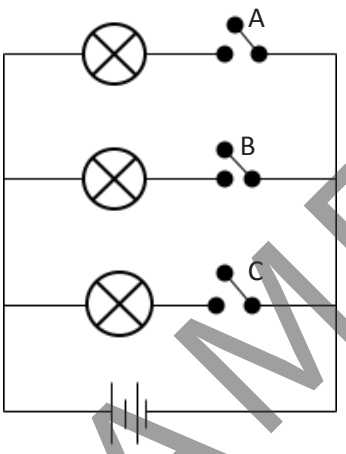
ACTIVITY 6: Parallel circuit.

AIM: To investigate the effect of connecting bulbs in parallel.

Materials:

- 3 x torch bulbs + holders
- Battery + holder
- Wire leads
- 3 x switches

Method



- Assemble the apparatus as shown in diagram above.
- Put switch A to ON position and record your observation.
- With A still ON, switch B to ON position and record your observation.
- With A and B ON, switch C to ON position and record your observation.
- Indicate the effect of connecting resistors in parallel

Results

Switch	Bulb brightness(very bright/bright/dim/OFF)		
	A	B	C
A ON	Very bright	Off	Off
A + B ON	Bright	Bright	Off
A + B + C ON	Dim	Dim	Dim

Discussion:

A parallel circuit is a current divider and the brightness of the bulbs will be the same when connected in parallel.

Conclusion

Bulbs connected in parallel will have same brightness.

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 8:

AIM: To demonstrate the relationship between pressure and volume.

MATERIALS

- Balloons or bicycle tyre or Boyle`s Law kit

METHOD

- Blow up a balloon. At first it will be difficult because the rubber is new and needs to stretch.
- Notice how much effort you need to put in to continue blowing up the balloon.
- What do you notice when the balloon gets very big?

Questions

1. Define pressure.
2. Explain why gas is compressible as compared to a solid.

GRADE: 9

STRAND: **LIFE & LIVING**

TERM 1

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 4: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- tea
- coffee
- milk
- fruit juices
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- phenolphthalein indicator

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A and B.
- Use a medicine dropper to drop three drops of Universal indicator in test tube A and record the colour changes.
- Use a medicine dropper to drop three drops of Universal indicator in test tube B and record the colour changes.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Follow up Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.
5. Form the results, identify the acids and the alkalis.

SOLUTIONS

1. A substance that releases H+ ions in solutions / a substance whose pH is below 7.
2. Sour taste, turns blue litmus red, pH less than 5
3. A substance that releases OH- ions solutions /a substance whose pH above 7
4. A substance that releases OH- /has a sour soapy feel /pH more than 7/turns red litmus blue
5. Depends on experiment/refer to CAPS document for an annexure on colours of indicators

Term 3

STRAND: ENERGY & CHANGE

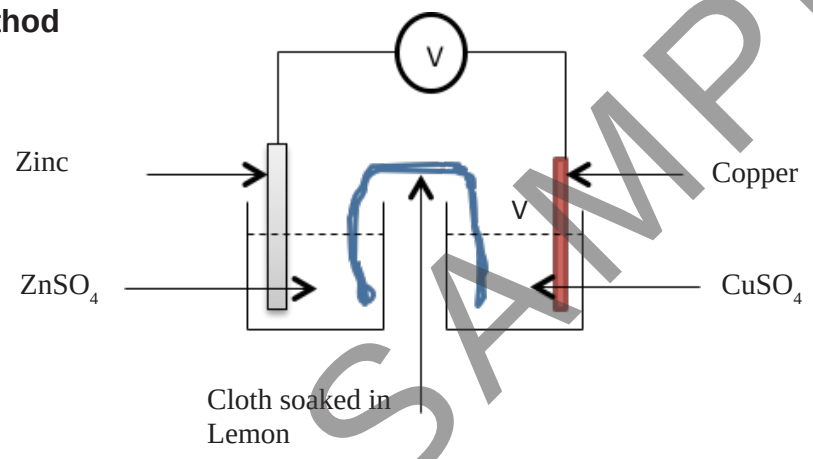
ACTIVITY 10: Electric cells

AIM: To make a cell by placing zinc and copper plates as electrodes.

Materials:

- Copper plate
- Zinc plate
- Copper sulphate solution
- Zinc sulphate solution
- Cloth soaked in either solution or lemon juice
- Voltmeter/LED

Method



- Setup the apparatus as shown in diagram
- The voltmeter may be replaced by an LED
- Make observations

Observation

unit	Reading / light up
Voltmeter	
LED	

Conclusion

Two solutions create electric from chemical reactions.

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 1: To show separation processes in mineral processing.

AIM: To show separation processes in mineral processing.

MATERIALS

- Beaker
- sieve
- small stones and sand

METHOD

- Load the sieve with the sand and stones.
- Agitate it and allow small particles to pass through.

Questions

1. Is the separation method a physical/chemical change

Leaner Manual – Senior Phase

- The **MSL** provides for 10 CAPS aligned Learner Manuals due to the fact that science is a group activity, making it possible to teach the class in groups.
- The Learner Manual has been developed to support the content (knowledge, concepts and skills) contained in the National Curriculum Statement (NCS), as organised in the new Curriculum and Assessment Policy Statement (CAPS).
- The Learner Manual has been organised to support teaching and learning in the classroom by presenting the material to be taught and practised in the classroom in discrete lessons.
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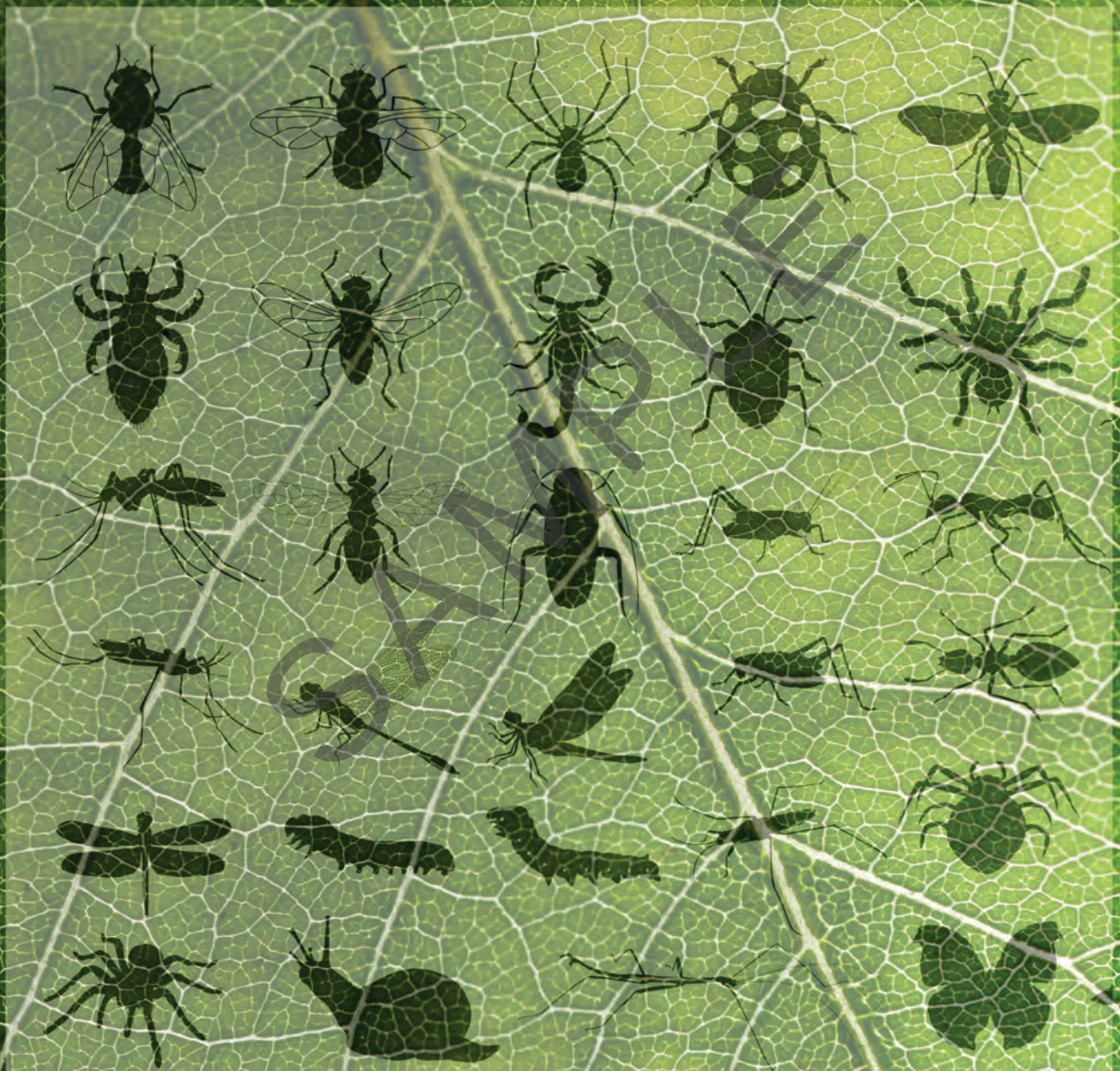
- In each lesson the learners will:
  - ⇒ Establish what they already know about a topic.
  - ⇒ Learn new facts about a topic.
  - ⇒ Practise using the new knowledge, concepts and skills they have acquired in the lesson.
- In addition, learners are provided with:
  - ⇒ Additional homework activities.
  - ⇒ Extra practice activities that cater for both learner support and enrichment.
  - ⇒ A summary of a cycle of work.
  - ⇒ A cycle may consist of one or more weeks' work.
- 10 x Learner – 297 x 210.

LEARNER'S MANUAL

Natural Science

Senior Phase



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Suppliers Of Educational Kits

NATURAL SCIENCES
GRADE: 7-9
LEARNER'S MANUAL

Contents

To the teacher

The manual contains demonstrations, investigations and worksheets based on the following strands:

- **Life and Living**
- **Matter and Materials**
- **Energy and Change**
- **Planet Earth and Beyond**

All the activities are based on the CAPS documents for grades 7 – 9

Manner of teacher demonstration

The teacher is expected to mediate demonstrations through large groups such as the whole class and small groups of 7 – 9 learners, resources permitting.

Learner participation

According to the spirit of CAPS, learners are expected to learn through:

- **Observations**
- **Active involvement including doing the actual activities.**
- **Collaborative and cooperative learning through group work.**

The layout of the activities (demonstrations, experiment and worksheets) is meant to afford the learners varied learning contexts that recognise that learners have different learning styles and preferences.

It is expected that the teacher guides the learners through the work and avoids giving solutions before they have tried the work on their own.

Each strand has prescribed experiments, investigations and demonstrations as well as worksheets activities that may be done by learners as individuals or in small groups of 7 – 9 learners. All these activities should be assessed by the teacher, peer or learner.

About the equipment in the kit

- **Grouping of learners**

  For the grades 4 – 6 it is advisable for the teacher to use the whole-class demonstration strategy so that every learner is attentive as well as avoid accidents. As for grades 4 – 6, learners may be allowed to work in small groups.

- **Safe keeping of equipment**

  It is best to keep the equipment in the provided container in its original packaging. The equipment should be cleaned after each use and made ready for the next demonstration.

- **Planning of practical work.**

  The teacher should go through the activity and actually do it before hand. This should allow the teacher to create model answers and responses to activities that inform and guide the lesson roll out.

How to use the activity sheets

- **Photocopy rights**

  The teacher is allowed to copy the activities for his / her class only.

Controlling the kit

- **Storage**

  Safe storage of equipment is important due to its high cost and the need for reuse.

- **Stock control**

  After each activity, the teacher should check against inventory when collecting back apparatus from learners. Broken material should be recorded and disposed of properly. Liquids should be placed in containers- organics and aqueous solutions in separate containers and NEVER down the drain.

Replacing of broken items and depleted chemicals

This can be done by ordering from kit supplier by naming the materials on the original kit.

Tips of managing lab activities in the classroom

General laboratory rules apply and include the following among many other rules:

1. No running or horse play is allowed in the lab
2. No eating, tasting of chemicals & pippetting using your mouth.
3. Safety apparel should be worn were applicable
4. LAB activities are supervised and no learner is allowed in the lab unsupervised.
5. Clean after the activities
6. Do not pour waste materials into the sink
7. Broken glass should be recycled
8. Read labels carefully.
9. Tie up, long hair and loose clothes.
10. Keep work area clear of all materials except those needed for your experiments.
11. Never smell a solvent.

GRADE: 7

STRAND: **LIFE & LIVING**

TERM: 1

ACTIVITY 1: The Biosphere

AIM: To investigate conditions required for germination of seeds.

MATERIALS

- bean seeds and maize flower
- containers
- soil
- water

METHOD

- Three-quarter fill, four big containers with dry soil collected from one area.
- Make six holes in each of about 4cm depth.
- Place three maize seeds in three holes on one side and three bean seeds on the other side of each container.
- Cover the holes with soil without compressing.
- Water two of the containers.
- Place a watered container and a dry one into a very dark cupboard.
- Place the other watered container and the dry one next to a window such that they are exposed to the sunlight.
- Record your observations each day for the next eight days and compile a report.
- As the seeds germinate, measure the heights of the seedlings each day for use in the next ex periment.
- Answer the questions below.

Questions

1. From your experiment, what was required for germination to occur?
2. What other conditions are required for germination to take place?

ACTIVITY 2: The Biosphere

AIM: To investigate conditions required for growth of seedlings.

MATERIALS

- seedlings from Activity 1
- rulers/ measuring tapes

METHOD

- Recover the data of length of seedlings from Activity 1.
- Continue to take daily measures of the heights of the seedlings. Do not remove the container from the cupboard.
- Stop measuring on the 15th day from the day you planted the seeds.
- Tabulate your results and compile a report.
- Answer the questions below.

Questions

1. Compare the heights of seedlings in the sunlight and the ones in the dark cupboard.
2. From your experiment, what was required for healthy growth of seedlings to occur?
3. What other conditions are necessary for the growth to take place?
4. Design an experiment to illustrate the effect of a condition given in 3 above.

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 1: Physical and Chemical Change

AIM: To represent the structure and composition of compounds.

MATERIALS

- ice
- beakers
- burner
- thermometer,
- stop watch

SAFETY PRECAUTION
1. Spirit is highly flammable and must be handled with care.

METHOD

- Place some ice in a beaker.
- Measure the temperature of the ice and record it.
- Heat the ice and after 1 minute measure the temperature again and record it. Repeatevery minute, until at least 10 minutes after the ice has melted.
- Record the values of temperature after every 1 minute.
- Plot a graph of time versus temperature for the heating of ice.

Observations

Write down the observations in point form.

Table of Results.

time/ - (s)	0	1	2	3	4	5	6	7	8	9	10
Temperature (^{o}C)											

Questions

Plot a graph of temperature vs time and join the points using a smooth curve.

1. Is water an element or a compound. Give a reason for your answer.
2. Is melting of ice a chemical or physical change?
3. Draw the electron configuration of the atoms of Hydrogen and Oxygen.
4. State the independent and dependent variables.
5. Use sketches to show the difference between ice and liquid water in terms of arrangement of particles.

ACTIVITY 2: Separating mixtures.

AIM: To separate the mixture of salt, water and spirit.

MATERIALS

- Burners
- beaker
- distillation column
- Elernmeyer flask

SAFETY PRECAUTION
2. Take care since heat will be used.

METHOD

- Mix the three substances in a conical flask.
- Heat the solution strongly and collect the methylated spirit first sand then were and the solid salt particles that remain behind.

Question

1. What property of water enables it to be separated from methylated spirit?
2. What process is used to separate water and salt?

ACTIVITY 3: Separating mixtures.

AIM: To separate an ink dot into separate colours.

MATERIALS

- Beaker
- glass road
- water
- ink
- filter paper

METHOD

- Mark a dot on filter paper using black ink
- Suspend the filter paper vertically and allow the remaining half of the paper to be immersed in water.
- Make observations

Questions

1. Is chromatography a physical/chemical change?

ACTIVITY 4: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- tea
- coffee
- milk
- fruit juices
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- phenolphthalein indicator.

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A and B.
- Use a medicine dropper to drop three drops of Universal indicator in test tube A and record the colour changes.
- Use a medicine dropper to drop three drops of Universal indicator in test tube B and record the colour changes.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.
5. Form the results, identify the acids and the alkalis.

ACTIVITY 5: Acids and Bases.

AIM: To test and classify household beverages as acids or alkaline.

MATERIALS

- tea
- coffee
- milk
- fruit juices
- fizzy drinks

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A.
- Test using a separate litmus paper ,blue and red by dipping about 1cm of the paper.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.
5. Form the results, identify the acids and the alkalis.

ACTIVITY 6: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- red litmus paper
- blue litmus paper.

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A.
- Test using a separate litmus paper, blue and red by dipping about 1cm of the paper.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.
5. Form the results, identify the acids and the alkalis.

Term 3

STRAND: ENERGY & CHANGE

ACTIVITY 1: Conversion of mechanical energy to other forms

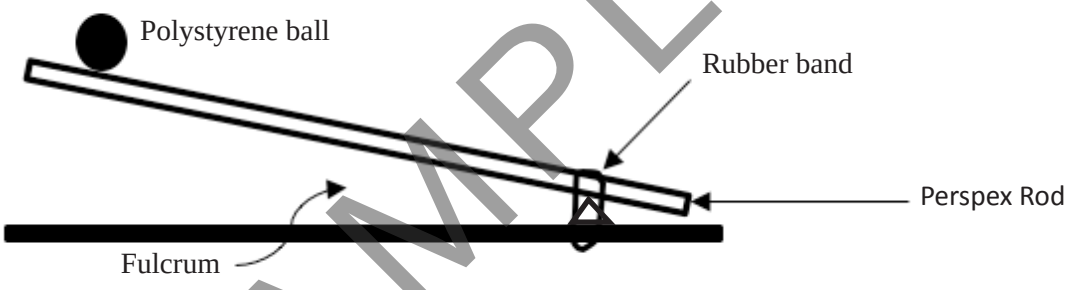
AIM: To investigate the conversion of energy using mechanical systems

Materilals:

- Perspex rod
- Rubber band
- Fulcrum
- Polystyrene ball

Safety Caution:
Do not direct the catapult towards other learners. Stay clear of the path of the polystyrene ball!

Method



- Assemble the apparatus as shown in diagram.
- Put the rubber band into the slits on the board and make two turns.
- Pull one turn of the rubber band and pass through the Perspex rod.
- Support the Perspex rod on the fulcrum.
- Push the free end of the Perspex downwards and place a polystyrene ball on it.
- Release the free end and watch the ball fly away.
- Record the distance covered by the ball.
- Put the Perspex rod through 2 two turns and repeat steps 4 to 7.

Results

Number of Turns	Distance covered(m)
1	
2	

ACTIVITY 2: Conversion of mechanical energy to other forms

AIM: To investigate the conversion of potential energy using mechanical systems such as a scissors

Materials:

- Scissors
- Newspaper

Method

- Cut through 2 pages of a newspaper and observe the extent of pressure required.
- Repeat step 1 for 4, 6 and 10 pages.
- Record your observation.

Observation

No of pages	Ease of cutting
2	
4	
6	
10	

Conclusion

ACTIVITY 3a: Energy Transfer In Thermal Systems.

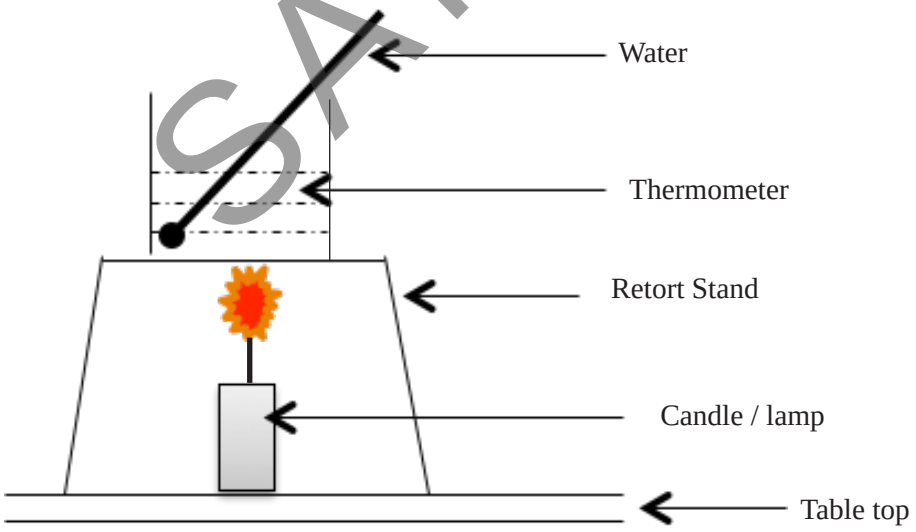
AIM: To investigate energy transfers using thermal systems.

Materials:

- Candle / burner
- Matches
- 250 ml Beaker x 2
- Thermometer
- Water
- Retort stand

Safety Caution: Teacher should ensure that safety requirements are observed and that learners are not left unattended.

Method



- Step the apparatus as shown in diagram and use 10ml of water
- Record the initial temperature of water.
- Heat the water for 10 minutes and record temperature of the water every 2 minutes.
- Plot graph of temperature versus time

Results

Time / min	Temperature of water / °C
0	
2	
4	
6	
8	
10	

Conclusion

ACTIVITY 3b: Energy transfer in thermal systems:

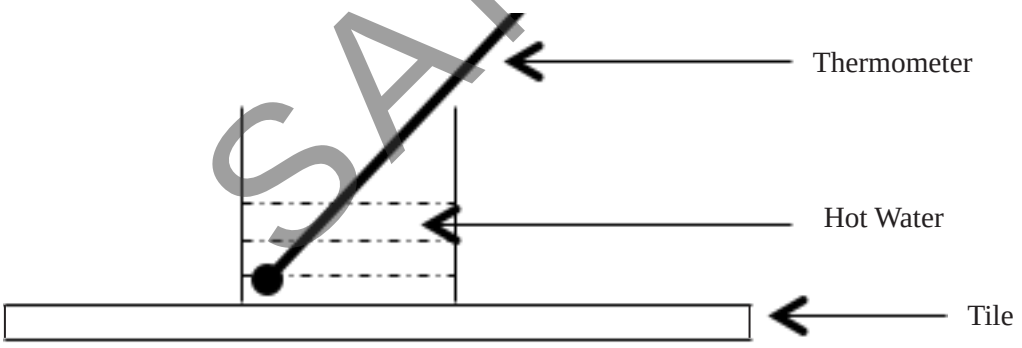
AIM: To investigate energy transfers in thermal systems.

Materilals:

- Bean Seed or tuft of grass
- 250 ml Beaker
- Thermometer
- Hot Water
- Tile

Safety Caution: Teacher should ensure that safety requirements are observed and that learners are not left unattended.

Method



- Set up the apparatus as shown in diagram
- Record the initial temperature of water.
- Heat the water with a burning bean seed or a tuft of grass.
- Record temperature of the water every 2 minutes.
- Plot graph of temperature versus time

Results

Time / min	Temperature of water/°C
0	
2	
4	
6	
8	
10	

Conclusion

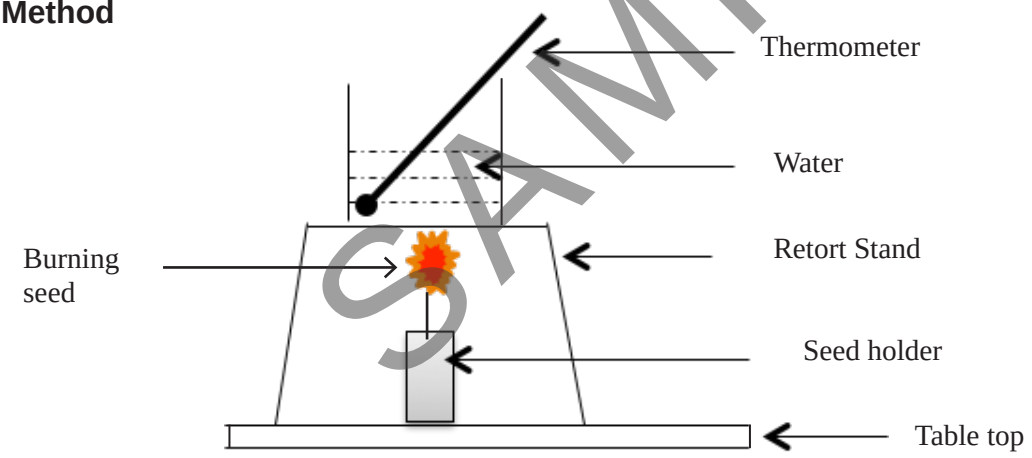
ACTIVITY 3c: Energy transfer in biological systems.

AIM: To investigate energy transfers using thermal systems.

Materilals:

- Bean seed or tuft of grass
- Matches
- 250 ml Beaker
- Thermometer
- Water
- Retort stand

Method



- Step the apparatus as shown in diagram
- Record the initial temperature of water.
- Heat the water for 10 minutes and record temperature of the water every 2 minutes.
- Plot graph of temperature versus time
- Repeat with a tuft of grass

Results

Time / min	Temperature of water/°C
0	
2	
4	
6	
8	
10	

Conclusion

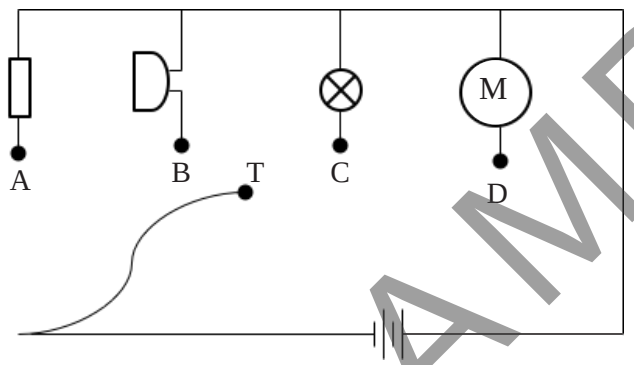
ACTIVITY 4: Energy transfer in electrical systems.

AIM: To convert electricity to Heat, sound, light and motion

Materials:

- Battery + holder
- Fan / Motor
- Light bulb + holder
- Buzzer
- Resistor
- Wire leads

Method



A= Resistor

B=Buzzer

C=Lamp

D=Motor

- Assemble the apparatus as shown in diagram above.
- Connect terminal T to A for at least 1 minute and touch the resistor.
- Record the observation.
- Connect the terminal T to B and record observation.
- Repeat step 4 for points C and D

Results

Component	Observation
Resistor	Becomes hot
Buzzer	Gives a buzz sound
Lamp	Lights up
Motor	Turns.

Conclusion

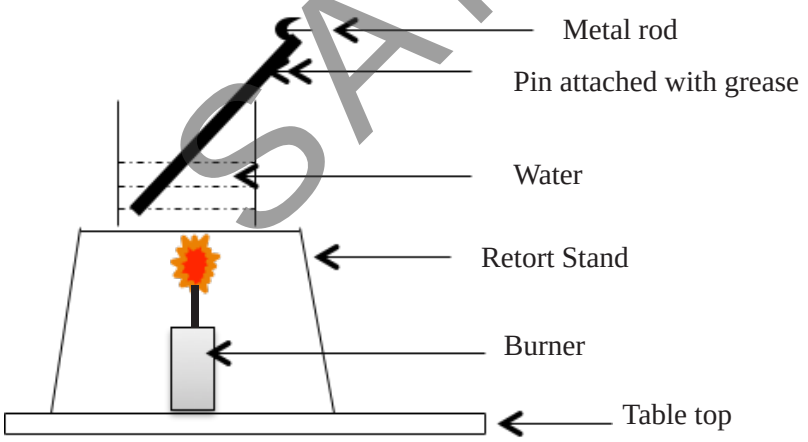
ACTIVITY 5: Heat conduction using various materials

AIM: To investigate energy transfers using thermal systems

Materials:

- Spirit or Bunsen burner
- Metal rods(steel, aluminium, copper, brass and iron) of same dimensions
- Non –metal rods (plastic, wood, Styrofoam)
- Grease / Vaseline
- Drawing pin
- Water bath
- Stop watch / cellphone with stop watch/ wrist watch with second hand

Method



- Step the apparatus as shown in diagram and heat the water bath to at least 70°C
- Record the time taken for the pin to fall off
- Repeat for other metals and the non-metals
- Draw bar graph to show the results

Results

Metal	Time for pin to fall off/ seconds
Steel	
Iron	
Copper	
Brass	
aluminium	
wood	
plastic	
Styrofoam	

Conclusion

ACTIVITY 6: Investigation of convection currents in water

AIM: To determine convection currents in water.

Materials:

- Beaker
- Water
- Potassium permanganate crystals / food colouring
- Bunsen or spirit burner

Method

- Drop a few potassium permanganate crystals into water in a beaker
- Heat the water and make observation.
- Draw the path followed by the colour

Observations

Conclusion

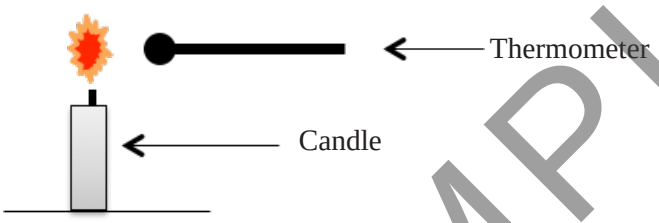
ACTIVITY 7: Heat transfer through radiation.

AIM: To investigate heat transfer through radiation by candle light.

Materilals:

- Candle
- Thermometer
- Ruler

Method



- Record the initial temperature before bringing the thermometer next to the burner.
- Place the thermometer 1 cm away from the candle as shown in diagram
- Record the temperature record the new temperature after 1 or 2 minutes.
- Repeat steps 2 and 3 for 2, 3, 4 and 5 cm
- Draw a bar graph show radiation as distance from candle increases

Results

Distance from candle/cm	Temperature/°C
1	
2	
3	
4	
5	

Conclusion

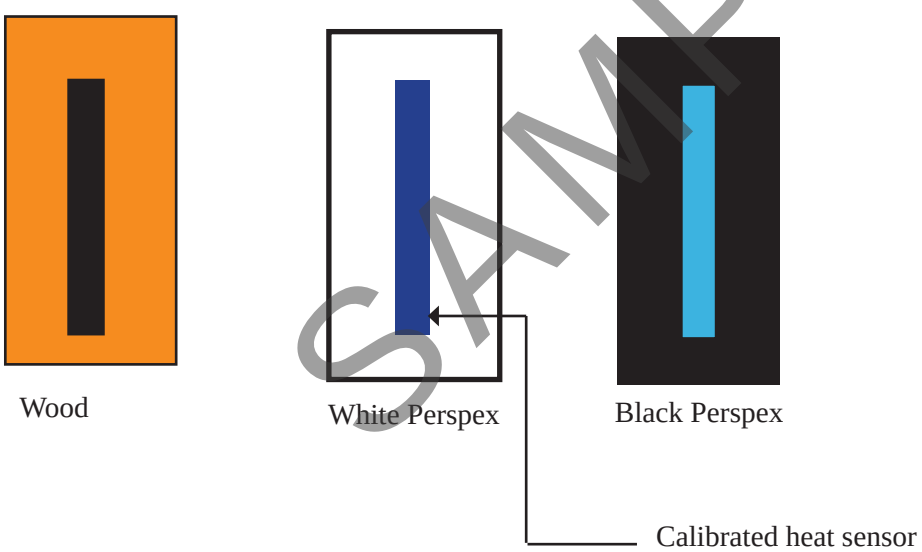
ACTIVITY 8: Investigating the amount of radiant heat absorbed by surfaces

AIM: To investigate the absorption of heat energy by different surfaces.

Materilals:

- 5 x Calibrated heat sensing strips / soft margarine
- Wood board
- Perspex white board
- Perspex black board
- Shiny metal bar(may covered with aluminium)

Method



Method

- Attach the calibrated heat sensor strips to the boards as shown above.
- Place the boards under the sun
- Record temperature readings after 20 minutes.
- Draw a line graph to show the results.

(In the absence of calibrated sensor strips, the alternate method will involve:

Putting a small dab of margarine on each strip and noting the times each will melt.)

Results

Material	Temperature(°C)
Wood	
White Perspex	
Black Perspex	
Shiny surface	

Conclusion

ACTIVITY 9a: Investigating various insulating materials

AIM: To investigate how well non-metals prevent heat loss.

Materials:

- Styrofoam cups
- Plastic container
- Glass container / beaker
- Tin
- Thermometer
- Hot water
- watch

Method

- Place hot water at 70°C into each container
- Place a thermometer in each container
- Record temperature after 20 min
- Arrange the materials in terms of their insulating capabilities

Results

material	Temp after 20 min	Insulating capability
Styrofoam cups		Very good
Glass container		poor
Plastic container		good
tin		poor

Conclusion

ACTIVITY 9b: Investigating various insulating materials

AIM: To investigate how well non-metals prevent heat gain.

Materials:

- Styrofoam cups
- Plastic container
- Glass container / beaker
- Tin
- Tin wrapped with newspaper
- Thermometer
- Ice
- watch

Method

- Place an equal amount of ice blocks in each container
- Place a thermometer in each container
- Record temperature after 20 min
- Arrange the materials in terms of their insulating capabilities

Results

material	Temp after 20 min	Insulating capability
Styrofoam cups		
Glass container		
Plastic container		
tin		
Tin wrapped with newspaper		

Conclusion

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 1: Passage of Earth around the Sun.

AIM: Passage of the Erath around the Sun.

MATERIALS

- Torch
- Inflatable globe

Method:

- **Learner A:** Hold torch towards the tilted Earth globe, at the middle of tilted Earth globe
- **Learner B:** Hold the tilted Earth globe at 1 m away from the torch
- Shine the torch and investigate the spreading of a beam of 'sunlight' as it is applied to various parts of the globe.
- Note the amount of surface covered by a beam of 'sunlight.
- **Learner B:** Walk a ¼ of the way around the torch

Questions

1. What do you think the torch light represents
2. What is the degree of tilted angle
3. Explain the spreading of a beam of sunlight
4. How does this explains nights and day, and seasons of the year

ACTIVITY 2: Pull of gravity.

AIM: Pull of gravity.

MATERIALS

- String
- Ball

Method:

- Tie a string to a ball
- Hold it with your hand above your head and spin it in a circular motion

Questions

1. What happens when you let go the string
2. What happens when you don't let go the string
3. What will happen if you spin much faster
4. What does the hand and ball represent
5. Explain what happened using forces

GRADE: 8

STRAND: **LIFE & LIVING**

TERM: 1

ACTIVITY 2: Content of Carbon dioxide in exhaled air.

AIM: To test for carbon dioxide in exhaled air.

MATERIALS

- lime water
- four drinking straws
- two test tubes
- two perforated stoppers

SAFETY PRECAUTION

1. ***Lime water is an irritant. Avoid skin and eye contact.***

METHOD

- Label test tubes A and B and half fill each with lime water.
- Insert two straws on each stopper.
- Stopper each test tube such that one of the straws is half way below the lime water. The other straw must be hanging half way between the top of the test tube and the lime water.
- In test tube A, breath in through the straw that is hanging above the lime water. Observe.
- In test tube B, gently breath out through the straw that is dipped in the lime water. Observe.
- Compile a report and individually answer the questions below.

Questions

1. State all the differences and similarities that you observed between lime water in test tubes A and B.
2. What caused the changes that you observed?
3. Basing on your experimental results, what can you conclude about exhaled air?

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 2:

AIM: To demonstrate and record observations of how potassium permanganate decomposes into elements by heating

MATERIALS

- Potassium permanganate ($KMnO_4$) solid
- A Bunsen burner
- A test tube (pyrex)
- A test tube holder
- A wooden splint
- Matches

METHOD

- Put a spatula of potassium permanganate in the boiling tube.
- Hold the tube with a test tube holder and heat the potassium permanganate. Move the tube in and out of the flame. Use a lighted splinter to test for the gas.
- Record what you observe

Questions

1. Write down the symbolsof the elements found in the compound potassium permanganate.
2. How do you know that there has been a chemical reaction?

Term 3

STRAND: ENERGY & CHANGE

ACTIVITY 1: Friction And Static Electricity

AIM: To investigate the effect of charges created by rubbing materials.

Materials:

- Nylon or silk cloth
- Plastic or Perspex Ruler
- Pieces of tissues paper
- Saw dust

Method

- Rub the Perspex or plastic ruler with a nylon or silk cloth
- Bring the ruler next to the pieces of tissue paper or saw dust
- Observe what happens and describe in terms of same or opposite charges

Results

	Attracts paper (YES/NO)	Attracts Sawdust (YES/NO)	Charge same (YES/NO)
Plastic Ruler rubbed with nylon			
Plastic Ruler rubbed with silk			
Perspex Ruler rubbed with nylon			
Perspex Ruler rubbed with silk			

Conclusion

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 8:

AIM: To demonstrate the relationship between pressure and volume.

MATERIALS

- Balloons or bicycle tyre or Boyle`s Law kit

METHOD

- Blow up a balloon. At first it will be difficult because the rubber is new and needs to stretch.
- Notice how much effort you need to put in to continue blowing up the balloon.
- What do you notice when the balloon gets very big?

Questions

1. Define pressure.
2. Explain why gas is compressible as compared to a solid.

GRADE: 9

STRAND: **LIFE & LIVING**

TERM 1

Term 2

STRAND: MATTER & MATERIALS

ACTIVITY 4: Acids and Bases.

AIM: To test and classify household substances as acids or alkaline.

MATERIALS

- Water
- tea
- coffee
- milk
- fruit juices
- washing powder
- tartaric acid
- bicarbonate of soda solution
- salt water
- universal indicator
- phenolphthalein indicator

SAFETY PRECAUTION
1. Do not taste any of the substances.

METHOD

- Measure 10cm^3 of each of the provided solutions using a measuring cylinder and separate the volume into two separate test tubes labelled A and B.
- Use a medicine dropper to drop three drops of Universal indicator in test tube A and record the colour changes.
- Use a medicine dropper to drop three drops of Universal indicator in test tube B and record the colour changes.
- Repeat the method for each of the substances provided.
- Record your results in a table.

Questions

1. Define an acid.
2. State three properties of an acid.
3. Define an alkali.
4. State two properties of an alkali.

Term 3

STRAND: ENERGY & CHANGE

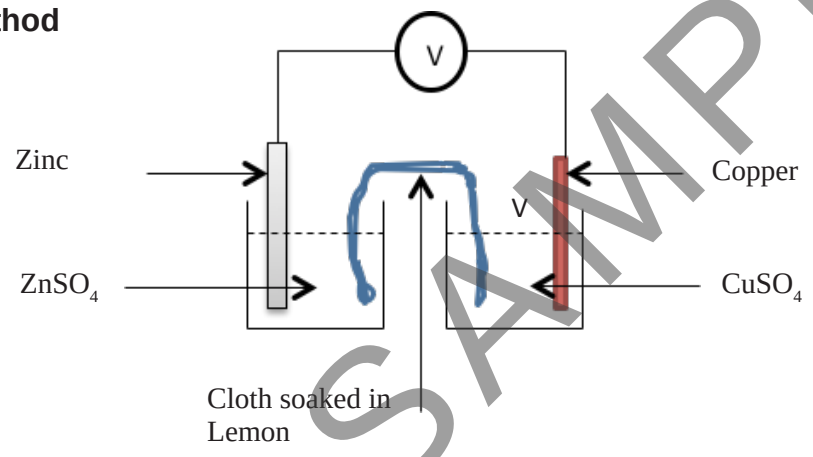
ACTIVITY 10: Electric cells

AIM: To make a cell by placing zinc and copper plates as electrodes.

Materials:

- Copper plate
- Zinc plate
- Copper sulphate solution
- Zinc sulphate solution
- Cloth soaked in either solution or lemon juice
- Voltmeter/LED

Method



- Setup the apparatus as shown in diagram
- The voltmeter may be replaced by an LED
- Make observations

Observation

unit	Reading / light up
Voltmeter	
LED	

Conclusion

Term 4

STRAND: PLANET EARTH & BEYOND

ACTIVITY 1: To show separation processes in mineral processing.

AIM: To show separation processes in mineral processing.

MATERIALS

- Beaker
- sieve
- small stones and sand

METHOD

- Load the sieve with the sand and stones.
- Agitate it and allow small particles to pass through.

Questions

1. Is the separation method a physical/chemical change

Safety Manual

1 x Laboratory Safety Database – 297 x 210

Disclaimer

This manual contains information and guidelines that are believed to be reliable regarding the safe use and handling of chemicals in laboratories and student classrooms. The South Africa Chemical Institute (SACI) , however, does not purport in this manual, or in any other publication, to specify minimum safety or legal standards or to address all of the compliance requirements, risks, or safety problems associated with the handling of hazardous chemicals, their use, or the methods prescribed for using them in laboratories or classrooms. This manual is intended to serve only as a beginning point for information and should not be construed as containing all the necessary compliance, safety, or warning information, nor should it be construed as representing the policy of SACI.

No warranty, guarantee, or representation is made by SACI as to the accuracy or sufficiency of the information and guidelines contained herein, and SACI assumes no liability or responsibility in connection therewith. It is the responsibility of the users of this manual to consult and comply with pertinent local, provincial and national laws, regulations, and standards with respect to the handling of chemicals. Users of this manual should consult with the school's legal counsel or other professional advisers about the applicable laws, safety issues, and compliance issues for storing chemicals and the methods for using the chemicals in school classrooms and laboratories.

Introduction

All chemicals are hazardous, but they all can be used safely if we know how to control their hazardous characteristics while we use them. The suppliers of chemicals used in our schools are aware of and fulfil their responsibilities to inform their customers of the hazardous characteristics of the chemicals they provide. Suppliers provide this information both by labels on the containers and by Material Safety Data Sheets (MSDSs) (provided separately). According to the South African, Occupational Safety and Health Administration (OSHA) and, in some cases, corresponding national regulations, it is the employer's responsibility to ensure that this important precautionary information is conveyed to educators. Typically, a supervisor informs educators on behalf of the principal.

The educators inform their students what to do and what to avoid when they prepare and perform experiments that involve chemicals and when they clean up afterward. Everyone is responsible: students, educators, Head of Departments (HoD's), and higher administrators. All must work together to ensure that educators and students use and handle chemicals with appropriate care and precaution. It is the intent of this manual to assist all those responsible, particularly HoD's and educators, in fulfilling these responsibilities.

Manual

Laboratory Safety Manual & Materials Safety Data Sheet

Pfunzo Ye Sive™

Suppliers Of Educational Kits

TABLE OF CONTENTS

LABORATORY RULES

1. Conduct yourself in a responsible manner at all times in the laboratory.
2. Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ASK YOUR TEACHER BEFORE PROCEEDING WITH THE ACTIVITY.
3. Never work alone in the laboratory. No student may work in the science classroom without the presence of the teacher.
4. When first entering a science room, do not touch any equipment, chemicals, or other materials in the laboratory area until you are instructed to do so.
5. Perform only those experiments authorized by your teacher. Carefully follow all instructions, both written and oral. Unauthorized experiments are not allowed.
6. Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
7. Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Never fool around in the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
8. Always work in a well-ventilated area.
9. Observe good housekeeping practices. Work areas should be kept clean and tidy at all times.
10. Be alert and proceed with caution at all times in the laboratory. Notify the teacher immediately of any unsafe conditions you observe.
11. Dispose of all chemical waste properly. Never mix chemicals in sink drains. Sinks are to be used only for water. Check with your teacher for disposal of chemicals and solutions.
12. Labels and equipment instructions must be read carefully before use. Set up and use the equipment as directed by your teacher.
13. Keep hands away from face, eyes, mouth, and body while using chemicals or lab equipment. Wash your hands with soap and water after performing all experiments.

14. Experiments must be personally monitored at all times. Do not wander around the room, distract other students, startle other students or interfere with the laboratory experiments of others.

15. Know the locations and operating procedures of all safety equipment including: first aid kit(s), and fire extinguisher. Know where the fire alarm and the exits are located.

16. Know what to do if there is a fire drill during a laboratory period; containers must be closed, and any electrical equipment turned off.

REFLEXES

LONG HAIR MUST BE TIED BACK, WEAR GLOVES, WEAR A LAB COAT(MANDATORY).

CLOTHING

17. Any time chemicals, heat, or glassware are used, learners will wear safety goggles. NO EXCEPTIONS TO THIS RULE!

18. Contact lenses may not be worn in the laboratory.

19. Dress properly during a laboratory activity. Long hair, dangling jewellery, and loose or baggy clothing are a hazard in the laboratory. Long hair must be tied back, and dangling jewellery and baggy clothing must be secured. Shoes must completely cover the foot. No sandals allowed on lab days.

20. A lab coat or smock should be worn during laboratory experiments.

ACCIDENTS AND INJURIES

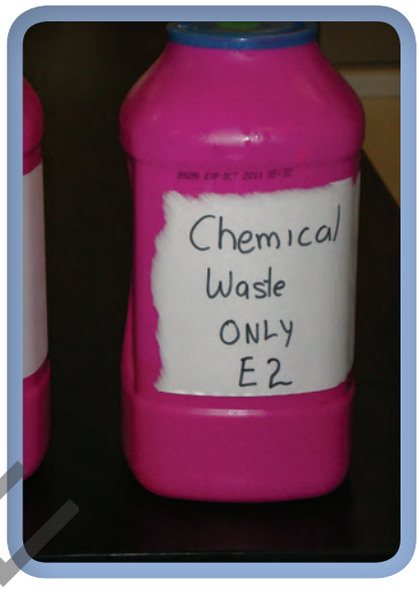
21. Report any accident (spill, breakage, etc.) or injury (cut, burn, etc.) to the teacher immediately, no matter how trivial it seems. Do not panic.

22. If you or your lab partner is hurt, immediately (and loudly) yell out the teacher's name to get the teacher's attention. Do not panic.

23. If a chemical should splash in your eye(s) or on your skin, immediately flush with running water for at least 20 minutes. Immediately (and loudly) yell out the teacher's name to get the teacher's attention.

HANDLING CHEMICALS

All chemicals in the laboratory are to be considered dangerous. Avoid handling chemicals with fingers. Always use a tweezers. When making an observation, keep at least 1 foot away from the specimen. Do not taste, or smell any chemicals.



24. Check the label on all chemical bottles twice before removing any of the contents. Take only as much chemical as you need.

25. Never return unused chemicals to their original container.

26. Never remove chemicals or other materials from the laboratory area.

HANDLING GLASSWARE AND EQUIPMENT

27. Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken glass in the designated glass disposal container.

28. Examine glassware before each use. Never use chipped, cracked, or dirty glassware.

29. If you do not understand how to use a piece of equipment, ASK THE TEACHER FOR HELP!

30. Do not immerse hot glassware in cold water. The glassware may shatter.

31. Do not operate a hot plate by yourself. Take care that hair, clothing, and hands are a safe distance from the hot plate at all times. Use of hot plate is only allowed in the presence of the teacher.

32. Heated glassware remains very hot for a long time. They should be set aside in a designated place to cool, and picked up with caution. Use tongs or heat protective gloves if necessary.

HEATING SUBSTANCES

33. Never look into a container that is being heated.

34. Do not place hot apparatus directly on the laboratory to cool before touching it.

35. Always use an insulated pad. Allow plenty of time for hot apparatus

CHEMICAL HAZARDS

PICTOGRAMS AND HAZARD CODES

They inform you of the major risks.


F-Highly flammable


T-Toxic, T+very toxic


X-Harmful
Xi- Irritant


O - Oxidizing


C - Corrosive


E - Explosive


B - Biohazard


N - Dangerous for the environment


R - Radioactive

Note: the letters E, O, F, F+, T, T+, C, Xn, Xi, N do not form part of the symbols.

CHEMICAL PRODUCTS = DANGER, INFORM YOURSELF ABOUT THE RISKS!

Due to their physicochemical, toxicological and eco-toxicological properties chemicals can be dangerous for the physical integrity and health of individuals and for the safeguarding of the environment.

Do not manipulate them without knowing the risks related to their use. Check the labelling of commercial products and the Material Safety Data Sheet.

THE STATEMENTS R AND S

The statements of risks R and safety precautions S, which are present on the labels, supplement the pictograms.

ATTENTION !

FOR CERTAIN TOXIC PRODUCTS (MUTAGENIC, CANCEROGENIC, REPROTOXIC) NO PICTOGRAMS EXISTS, BUT PHRASES LIKE:

R 39 Danger of very serious irreversible effects

R 45 May cause cancer

R 46 May cause heritable genetic damage

R 60 May impair fertility

R 61 May cause harm to the unborn child

MATERIAL SAFETY DATA SHEET (MSDS)

Before using or even buying a product, consult its MSDS. You will find information (which complements those of the label) on its physico-chemical properties, on the risks related to its use and the measures of prevention, on its storage and on its disposal.

ACETONE

MATERIAL SAFETY DATA SHEET

Chemical Product

Product Name: Acetone

Synonym: 2-propanone; Dimethyl Ketone; Dimethyl formaldehyde; Pyro-acetic Acid

Chemical Name: Acetone **Chemical Formula:** CH_3COCH_3

Composition and Information on Ingredients

NAME	% by weight
Acetone	100

Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female,

Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance maybe toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 465°C

Flash Points: CLOSED CUP: -20°C. OPEN CUP: -9°C.

Flammable Limits: LOWER: 2.6% UPPER: 12.8%

Products of Combustion: These products are carbon oxides (CO, CO_2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Vapour may travel considerable distance to source of ignition and flash back.

Special Remarks on Explosion Hazards:

Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulphuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permono-sulphuric acid, Thiodiglycol +hydrogen peroxide, potassium ter-butoxide, sulphur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thitriazylperchlorate.

Accidental Release Measures

Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:

Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Handling and Storage

Precautions:

Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:

Store in a segregated and approved area (flammables area). Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapour respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapour respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) TWA: 750 STEL: 1500 (ppm)

Physical and Chemical Properties

Physical state and appearance: Liquid.

Odour: Fruity. Mint-like. Fragrant. Ethereal

Taste: Pungent, Sweetish

Molecular Weight: 58.08 g/mole

Colour: Colourless. Clear

pH (1% solution/water): Not available.

Boiling Point: 56.2°C

Melting Point: -95.35

Critical Temperature: 235°C

Specific Gravity: 0.79 (Water = 1)

vapour Pressure: 24 kPa (@ 20°C)

vapour Density: 2 (Air = 1)

Volatility: Not available.

Odour Threshold: 62 ppm

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.2

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility: Easily soluble in cold water, hot water

Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapour (LC50): 44000 mg/m3 4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified

Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to

the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.

Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behaviour) characterized by dizziness, drowsiness, confusion, headache, muscle weakness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting).

Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also

affect the Central Nervous System (behaviour), characterized by depression, fatigue, excitement, stupor, coma, head ache, altered sleep time, ataxia, tremors as well at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis.

Eyes: Eye irritation.

Ecological Information

Eco-toxicity:

Eco-toxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fatthead Minnow].

ppm any hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation

SILVER NITRATE
MATERIAL SAFETY DATA SHEET

Chemical Product

Product Name: Silver nitrate

Synonym: Lunar caustic; Silver (I) nitrate; Nitric acid, silver (I) salt

Chemical Name: Silver nitrate **Chemical Formula:** $AgNO_3$

Composition and Information on Ingredients

NAME	% by weight
Silver nitrate	100

Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering.

Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Prolonged exposure may result in skin burns and ulcerations. Over exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. The substance may be toxic to mucous membranes, skin, and eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

First aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: organic materials, combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Contact with combustible or organic materials may cause fire.

Special Remarks on Explosion Hazards:

Silver nitrate mixed with dry powdered magnesium may ignite explosively on contact with a drop of water. An explosive fulminate may be formed if silver nitrate is mixed with alcohols. Highly explosive is formed by the addition of calcium carbide to silver nitrate solution.

Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material.

Use water spray to reduce vapours. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Handling and Storage

Precautions:

Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Sensitive to light. Store in light-resistant containers.

Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapour and dust respirator. Be sure to use an approved / certified respirator or equivalent.

Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapour and dust respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.01 (mg/m Ag) (TLV); TWA: 0.01 (mg/m Ag) from OSHA (PEL). Consult local authorities for acceptable exposure limits.

Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid.)

Odour: Not available.

Taste: Bitter. Metallic

Molecular Weight: 169.87 g/mole

Colour: Colourless. White.

pH (1% solution/water): 6 - 7 [slightly acidic to neutral]

Boiling Point: Decomposition temperature: 440°C (824°F)

Melting Point: 212°C (413.6°F)

Critical Temperature: Not available.

Specific Gravity: 4.35 (Water = 1)

Vapour Pressure: Not applicable.

Vapour Density: 5.8 (Air = 1)

Volatility: Not available.

Odour Threshold: Not available.

Water/Oil Dist. Coeff: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water. Soluble in diethyl ether. Very slightly soluble in acetone. Solubility in water: 122 g/100 ml water @ 0°C. Solubility in water: 952 g /100 ml water @ 190 °C Solubility in alcohol: 1 g/30 ml alcohol; 1g/ 6.5 ml boiling alcohol. Solubility in acetone: 1 g/ 253 ml acetone.

Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, light

Incompatibility with various substances: Reactive with reducing agents, combustible materials, organ-

ic materials, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Sensitive to light. Incompatible with antimony salts, arsenites, bromides, carbonates, chlorides, iodides, thiocyanates, ferrous salts, hypophosphites, morphine salts, oils, creosote, phosphates, tannic acid, tartrates, vegetable decoctions, and extracts, sodium hydroxide, charcoal, benzalkonium chloride, halogenated acids and their salts. Silver nitrate reacts with acetylene in presence of ammonia to form silver acetylide, a sensitive powerful detonator when dry. Reaction between silver nitrate and chlorosulphonic acid is violent. Silver nitrate is reduced by hydrogen sulphide in the dark. Silver nitrate is easily reduces to metallic silver by ferrous salts, arsenites, hypophosphites, tartrates, sugars, tannins, volatile oils.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

TOXICOLOGICAL INFORMATION

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 50 mg/kg [Mouse].

Chronic Effects on Humans:

Causes damage to the following organs: lungs. May cause damage to the following organs: mucous membranes, skin, and eyes.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation.

Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic). May cause cancer based on animal test data. May cause adverse reproductive effects.

Special Remarks on other Toxic Effects on Humans

Acute Potential Health Effects: Skin: Causes severe irritation and burns. It may cause dermatitis. It may be absorbed through the skin. Eyes: Causes severe irritation, corneal opacification, bleeding conjunctiva, burns of conjunctiva, argyria, blindness

Inhalation: Causes irritation of the respiratory tract and mucous membranes with possible chemical burns. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting. Ingestion: Severe gastrointestinal tract irritation and burns, pain and burning in the mouth, violent abdominal pain, argyria -greyish/blackening of skin and mucous membranes, throat and abdomen, salivation, vomiting of black material, diarrhoea, hypermotility, ulcerative gingivitis . May affect kidneys (lesions of kidneys, anuria,) and lungs

Ecological Information

Eco-toxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Disposal Considerations

Waste Disposal:

Dispose of in a manner consistent with state, and local regulations.

Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Silver nitrate UNNA: 1493 PG: II

Special Provisions for Transport: Not available. PFUNDZO YESIVE

SULPHURIC ACID
MATERIAL SAFETY DATA SHEET

Chemical Product

Product Name: Sulphuric acid

Synonym: Sulphuric acid

Chemical Name: sulphuric acid **Chemical Formula:** H_2SO_4

Composition and Information on Ingredients

NAME	% by weight
Silver nitrate	100

Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of eye contact (irritant), of inhalation. Slightly hazardous in case of skin contact (corrosive). The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering.

Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Prolonged exposure may result in skin burns and ulcerations. Over exposure by inhalation may cause respiratory irritation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs. The substance may be toxic to mucous membranes, skin, and eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

First aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give

oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: organic materials, combustible materials

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Contact with combustible or organic materials may cause fire.

Special Remarks on Explosion Hazards:

Silver nitrate mixed with dry powdered magnesium may ignite explosively on contact with a drop of water. An explosive fulminate may be formed if silver nitrate is mixed with alcohols. Highly explosive is formed by the addition of calcium carbide to silver nitrate solution.

Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Oxidizing material. Corrosive solid. Stop leak if without risk. Do not get water inside container. Avoid con-

tact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material.

Use water spray to reduce vapours. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Handling and Storage

Precautions:

Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes.

Storage:

Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents and combustibles. See NFPA 43A, Code for the Storage of Liquid and Solid Oxidizers. Sensitive to light. Store in light-resistant containers.

Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Synthetic apron. Vapour and dust respirator. Be sure to use an approved / certified respirator or equivalent.

Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapour and dust respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.01 (mg/m Ag) (TLV); TWA: 0.01 (mg/m Ag) from OSHA (PEL). Consult local authorities for acceptable exposure limits.

Physical and Chemical Properties

Physical state and appearance: Solid. (Crystals solid.)

Odour: Not available.

Taste: Bitter. Metallic

Molecular Weight: 169.87 g/mole

Colour: Colourless. White.

pH (1% solution/water): 6 - 7 [slightly acidic to neutral]

Boiling Point: Decomposition temperature: 440°C

Melting Point: 212°C

Critical Temperature: Not available.

Specific Gravity: 4.35 (Water = 1)

Vapour Pressure: Not applicable.

Vapour Density: 5.8 (Air = 1)

Volatility: Not available.

Odour Threshold: Not available.

Water/Oil Dist. Coeff: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in cold water, hot water. Soluble in diethyl ether. Very slightly soluble in acetone. Solubility in water: 122 g/100 ml water @ 0°C. Solubility in water: 952 g /100 ml water @ 190 °C Solubility in alcohol: 1 g/30 ml alcohol; 1g/ 6.5 ml boiling alcohol. Solubility in acetone: 1 g/ 253 ml acetone.

Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, light

Incompatibility with various substances: Reactive with reducing agents, combustible materials, organic materials, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Sensitive to light. Incompatible with antimony salts, arsenites, bromides, carbonates, chlorides, iodides, thiocyanates, ferrous salts, hypophosphites, morphine salts, oils, creosote, phosphates, tannic acid, tartrates, vegetable decoctions, and extracts, sodium hydroxide, charcoal, benzalkonium chloride, halogenated acids and their salts. Silver nitrate reacts with acetylene in presence of ammonia to form silver acetylide, a sensitive powerful detonator when dry. Reaction between silver nitrate and chlorosulphonic acid is violent. Silver nitrate is reduced by hydrogen sulphide in the dark. Silver nitrate is easily reduces

to metallic silver by ferrous salts, arsenites, hypophosphites, tartrates, sugars, tannins, volatile oils.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

TOXICOLOGICAL INFORMATION

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 50 mg/kg [Mouse].

Chronic Effects on Humans:

Causes damage to the following organs: lungs. May cause damage to the following organs: mucous membranes, skin, and eyes.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation.

Slightly hazardous in case of skin contact (corrosive).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May affect genetic material (mutagenic). May cause cancer based on animal test data. May cause adverse reproductive effects.

Special Remarks on other Toxic Effects on Humans

Acute Potential Health Effects: Skin: Causes severe irritation and burns. It may cause dermatitis. It may be absorbed through the skin. Eyes: Causes severe irritation, corneal opacification, bleeding conjunctiva, burns of conjunctiva, argyria, blindness

Inhalation: Causes irritation of the respiratory tract and mucous membranes with possible chemical burns. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting. Ingestion: Severe gastrointestinal tract irritation and burns, pain and burning in the mouth, violent abdominal pain, argyria -greyish/blackening of skin and mucous membranes, throat and abdomen, salivation, vomiting of black material, diarrhoea, hypermotility, ulcerative gingivitis . May affect kidneys (lesions of kidneys, anuria,) and lungs

Ecological Information

Eco-toxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Disposal Considerations

Waste Disposal:

Dispose of in a manner consistent with state, and local regulations.

Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.

Identification: : Silver nitrate UNNA: 1493 PG: II

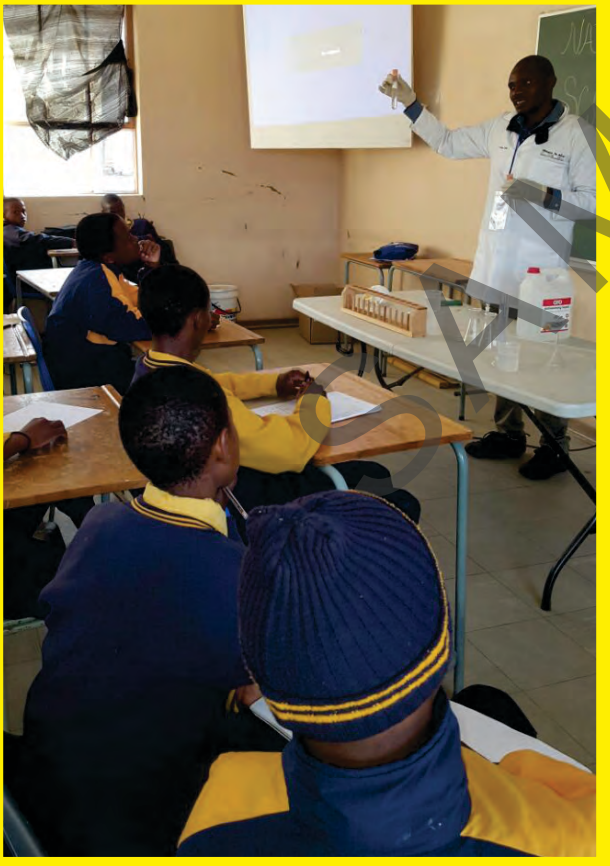
Special Provisions for Transport: Not available.

Training

- Educator training will be done for the **Mobile Science Laboratory™** upon delivery, describing content and usage of the Lab, for **FREE**.
- 5 days a week call center will also be available for further assistance from 8am to 5pm.

Additional Training

- Any additional training that is needed can be done over 4 sessions, which amounts to 8 hours at R 1, 800 per educator, over a period of 2 – 3 days, depending on the teacher's schedule.
- Further training is avaible per educator at a fee of R450 per session for 2 hours.
- All educators attending the additional training will be awarded a report for **Certifcate of Attendance**.
- The teachers will choose from a menu of items.
- Areas tackled are as follows:
    - Content & Methodology;
    - Problem solving;
    - Understanding the total curriculum;
    - Lesson planning;
    - Testing and assessment;
    - Tackling language diversity;
    - Teaching activities;
    - Transfer of learning;
    - Projects and practical work;
    - Materials and resources;
    - Tracking of learner performance; and
    - ICT-based learning.
- The Department of Basic Education requires teachers to engage in workshops that improve their professionalism, competencies and gain PD (Professional Development) points.
- In 2016, it became a legal requirement and has been monitored by the Department of Basic Education.
- Each teacher will be expected to achieve at least 150 PD points in every three year cycle.
- SACE will issue a Certificate of Achievement to each teacher who achieves the target number of PD points within the three years, as follows:
    - 150 points: Certificate of Achievement Bronze;
    - 151-300 points: Certificate of Achievement Silver; and
    - 300+ points: Certificate achievement Gold.

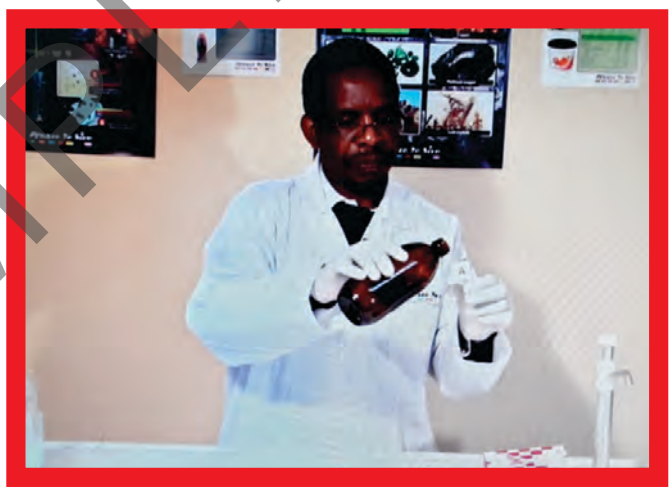


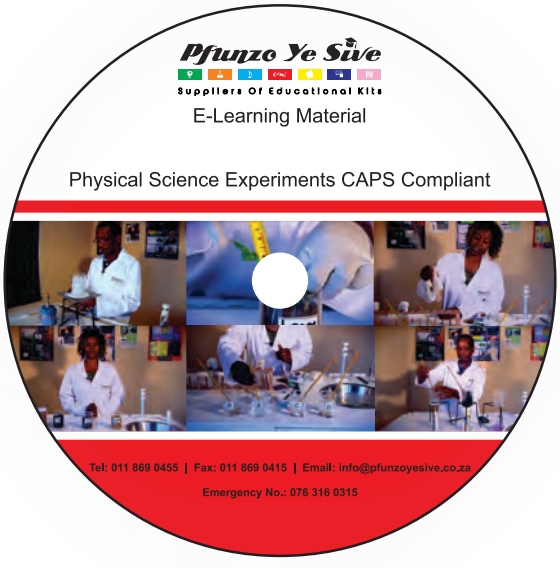
Optional Extra

- We have an IPAD with Experimental DVD – CAPS Aligned.
- Loaded with live demonstrations of the work to be covered in the term and year of assessment.
- These dvd's serves dual purposes:
    - For the teacher to brush up on lesson plans; and
    - For learners to watch and learn how to do experiments.

Pfunzo Ye Sive™
Suppliers Of Educational Kits

Experiment DVD`s





Pfunzo Ye Sive™
Suppliers Of Educational Kits

Recommendation

- 4 units per school

Transportation and Delivery

- We can deliver 10 – 15 units per week to respective schools.
- Depending on the size of the order, we would need lead time to plan and executive.
- Training will be done 2 days after deliver of units by our professional staff.
- All transporting will be handled by a Supplier, that has a proven track record, to deliver great service.
- Our transport provider is 100% BBBEE owned company employing over 80% preciously disadvantaged individuals.

Cost per unit

- Pfunzo Ye Sive **Mobile Science Laboratory™** Senior Phase (*including transport*):

  ⇒ Total: **Price on Request.**.

- Optional Extra:

  ⇒ IPAD with Experimental DVD – **R 8, 980-00**.

- Additional Educator Training:

  ⇒ 4 sessions (8 hours) at **R 1, 800-00**.
  ⇒ Additional to above will be at **R 450-00** per session.