Namushakende Secondary School

Natural Sciences Department

Integrated Science Laboratory Manual

Warning

Any breakages in the science laboratory will result in the replacement paid for by the candidate handling the apparatus

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Preface

I have made every effort to make this integrated Science Laboratory Manual as effective, clear, and readable as possible; to show the beauty and logic of integrated science practical; and to make integrated science enjoyable to learn. 'Personally, I am always ready to learn, although I do not always like being taught.' I believe that 'to teach is to learn twice'.

Working in the science laboratory can be enjoyable part of your science experiences. This integrated science laboratory manual is for your laboratory work both worthy and enjoyable. The integrated science laboratory tasks as presented in this manual are designed to test your abilities, but use the skills and values which you will acquire in integrated science to solve problems in everyday life. The manual for integrated science for junior secondary school leaving examination has been produced to support practical work required to be done in grade 8 and grade 9.

This integrated science laboratory manual is for use in strengthening teaching competencies, skills and subject knowledge of teachers of Science at the junior secondary school level through school-based assessments (SBA).

Additionally, the integrated science laboratory manual is also designed to help teachers acquire competences and skills in designing differentiated activities for learners with special education needs to enhance meaningful participation in learning activities.

Acknowledgments

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Appreciation of safety in the science laboratory

Safety is the state of non-exposure to hazards or to danger. It can also be described as the state of being safe.

Safety rules in the science laboratory

1. Enter a laboratory only when a teacher says so.
2. Always wear closed shoes. No one wearing open footwear such as slippers and sandals enters the laboratory. This is in order to reduce the chance of occurrence of foot injuries.
3. Wear protective clothes.
4. Do not run or play in the laboratory.
5. Do not perform any experiment without permission from the teacher, and always follow the instructions carefully. Avoid handling any unfamiliar equipment in the laboratory.
6. Do not drink, eat or taste anything in the laboratory except when allowed to by the teacher. The food might be contaminated with chemicals which are harmful to human beings. When you suspect poisoning, note the suspected poisoning agent and call your teacher immediately.
7. Always add acid to water and not water to acid. Never add water to concentrated acid as doing so may result into an accident since the little water coming into contact with the acid may boil immediately splashing the acid into your face.
8. Accidents and breakages must be immediately reported to the teacher.
9. Never point the mouth of a test tube containing a substance being heated towards another person or yourself.
10. Do not hold very hot objects with your hand. Hold them with a test tube holder, tongs or a piece of cloth or place them on a heat proof mat.
11. When smelling a substance, do not hold it very near the nose. Hold it about 20cm from the nose and with the hand wave the vapour towards the nose and sniff carefully.
12. Use specified or small amounts of substances in reactions to avoid waste and reactions which cannot be controlled.
13. Make sure you know the substances being used unless you are advised to use it as unknown
14. Any chemical accidentally taken into the mouth or spilt onto any part of the body should be washed off immediately with water and reported to the teacher. Seek medical attention.
15. Do not use broken glass-ware. Glassware should frequently be checked. Broken pieces of glassware should be put a vessel such as a bucket and kept securely for later disposal.
16. Do not bring flammable substances near a flame. If fires breaks out accidentally, quickly turn off the gas, electricity or water if necessary. Electrical installations in the laboratory should be checked for faults on a daily basis. This is in order to avoid the incidence of such accidents as fire resulting from a short circuit.
17. Wear eye protection when you are told to and keep it on until you are told to take it off when the practical is finished. Where a foreign matter enters the eye, flush with plenty of water. Use an eye wash bottle or fountain.
18. When you are told to use a Bunsen burner, make sure hair, cardigans, scarves, ties etc. are tied back or tacked in to keep them well away from the frame.
19. When you are working with liquids, always stand up and never sit. That way you can move out of the way easily if something spills.
20. Always put any waste solids in the correct liter bin and not in the sink.
21. Bottles should be never held by the neck.
22. Be careful that the name or label on the bottle is exactly the same as that of the chemical you require. Avoiding use of unlabeled chemicals. Any of such should be treated as potentially dangerous.

23. Before leaving the laboratory, clean the apparatus, work surface and your hands well. Nothing must be taken from the laboratory.
24. Make sure that no piece of apparatus is placed on the edge of a work bench. Apparatus that are not in use should be stored in the correct designated places. Those that are in use should be placed far from the bench edges.
25. Gangways should always be free of obstacles on which a person can stumble.
26. Gas taps should be kept closed at all times other than when gas burners are in use. It is also important to ensure that there are no leaking points in the gas pipes.
27. Avoiding overcrowding work benches with such things as bags and pieces of apparatus which are not in use.
28. When one suffers from burns, apply cold water. Call your teacher immediately.
29. When one has cuts and bruises, stop any bleeding by applying direct pressure. Cover cuts with a clean dressing. Call your teacher immediately. Due to possibility of infection, disposable gloves should be worn whenever there is a chance of contact with body fluids such as blood.
30. When one faints, leave the person laying down. Loosen any tight clothing and keep clowds away. Call your teacher immediately.
31. Any spills on skin, flush with large amounts of water or use safety shower. Call your teacher immediately.

Reasons why laboratory accidents may occur

- Lack of awareness
- Lack of control
- Lack of knowledge
- Lack of right attitude

Laboratories are delicate places. Carelessness can lead to serious accidents. To avoid such accidents, simple procedures or instructions should be followed strictly.

Drawings

- The section, **draw**, should be a correct one i.e. transverse section (T.S) or longitudinal section (L.S)
- The drawing should be realistic. It should resemble the actual specimen provided.
- The drawing should be large enough to cover the given space provided in the question paper
- The drawing should be clearly visible and must not have double lines, dirty rubbings, markings or shading except when showing a contrast e.g. in variegated leaves
- The drawing must be continuous i.e. without broken lines

Label lines

- Label lines should not have arrow heads
- Label lines should touch the appropriate structures. Hanging label lines do not earn any marks
- Label lines should be horizontal and must be parallel to each other. This means that label lines should not cross each other
- No label lines will be considered if the question specifically says no labeling is required
- The drawings and label lines should be done using the **HB** sharp pencil. Labels must be in pen

Magnification

Symbol: M

Units: Magnification has no units because the units cancel each other in the working steps

Definition: Magnification is the ratio of the size of the drawing to the size of the specimen

Magnification of the drawing means the number of times the drawing is enlarged compared to the specimen.

Formula: Magnification = $\frac{\text{Length of drawing}}{\text{Length of specimen}}$

Magnification = $\frac{\text{Diameter of drawing}}{\text{Diameter of specimen}}$

Procedure when calculating magnification

- Measure and record the longest length of the specimen in centimeters rounded off to one decimal place .e.g. 10.2cm or in millimeters with no decimal place e.g. 102mm
- Measure and record the longest length of the drawing in centimeters rounded off to one decimal place .e.g. 13.6cm or in millimeters with no decimal place e.g. 136mm
- Substitute the recorded values in the formula:

Magnification = $\frac{\text{Size of drawing (cm)/ (mm)}}{\text{Size of specimen (cm)/ (mm)}}$ (Size refers to length or diameter)

$M = \frac{13.6\text{cm}}{10.2\text{cm}}$ *or* $M = \frac{136\text{mm}}{102\text{cm}}$

M = 1.3333333 M = 1.3333333

Answers for magnification are recorded with a multiplication sign and represented and rounded off to one decimal place as:

- X1.3
- 1.3X
- 1.3 times
- times 1.3

Note

The specimen is the actual object given

When;

- M = 1, then the drawing and the specimen are of the same size
- M > 1, then the drawing is larger than the specimen
- M < 1, then the drawing is smaller the specimen

Making comparison

- In making comparisons, the power of observation should be used
- You should compare the colours, shapes, textures, size and parts and their arrangements
- You should look for parts that occur in one but do not occur in the other or if they occur in both, they could be more or less in one specimen than in the other
- If you are comparing fruits, consider the number of seeds, the size of seeds, the arrangement of seeds and the pericarp
- You should compare the outer skin, rings of tissue, zone etc. when examining slices of fruits or tubes

Preparation of food test reagents and solutions

1. **Recipe for Preparation of One Litre of Benedict's Solution**
   - Dissolve 173.0 g sodium citrate and 100.0 g sodium carbonate in 800 ml warm distilled water;
   - Separately dissolve 17.3 g copper (II) sulphate pentahydrate in 100 ml distilled water;
   - Slowly pour the first solution into the second solution with constant stirring;
   - Make the volume to 1 litre with distilled water.
2. **Recipe for Preparation of One Litre of Biuret Reagent**
   - Dissolve 1.5g copper (II) sulphate pentahydrate ($CuSO_4.5H_2O$) and 6.0g sodium potassium tartrate in 500ml distilled water;
   - Add 300ml 10 % (w/v) sodium hydroxide;
   - Make the volume to 1 litre with distilled water;
   - Add 1.0g potassium iodide to inhibit the reduction of copper.
3. **Recipe for the Preparation of One Litre of Iodine Solution**
   - Dissolve 6.0g potassium iodide in 200 ml distilled water;
   - Add 3.0g iodine crystals;
   - Make the volume to 1 litre with distilled water.
4. **Recipe for Preparation of One Litre of 1 % copper (II) sulphate solution**
   - Dissolve 10g of copper (II) sulphate in one liter of distilled water and shake thoroughly to mix or completely dissolve the contents.
5. **Recipe for Preparation of One Litre of 10 % sodium hydroxide solution**
   - Dissolve 100g of sodium hydroxide in one liter of distilled water and shake thoroughly to mix or completely dissolve the contents.
6. **Recipe for Preparation of One Litre of lime water**
   - Add 2.5g of calcium hydroxide to one liter of distilled water. Shake periodically over a 24 hour period. After settling, the lime water is ready for use.
7. **Recipe for Preparation of One Litre of 1% starch solution by weight**
   - Mix 10g analar soluble starch with 50ml distilled water. Boil 800ml distilled water and pour the mixture (starch-distilled water) into the boiling water;
   - Allow the contents to cool and make up to one litre with distilled water.

Food tests

Alternative term: *Biochemical food tests*

Definition: Food tests are experiments carried out to determine the presence or absence of a food nutrient in a food sample.

A nutrient is a substance which provides food for an organism

There are several types of food tests, but the main ones include the following:

1. test for starch – iodine test
2. test for proteins – biuret test
3. test for lipids/fats – emulsion test
4. test for reducing or simple sugars – Benedict's test
5. test for non – reducing or complex sugars

Facts on food tests

The procedure for each food test should be known.

If the food test requires heating, you should know the heating should be done

The sequence of the food test should be correct. If the procedure is wrong, observations and conclusions will also be wrong even though they are correct.

The amount of reagent for each food test should be known

Statements such as no change, no reaction are not accepted

The terms observations, results and conclusions (inference or deductions) should be known.

Test for starch

<table>
<tr><th>Test Method</th><th>Observation</th><th>Conclusion</th></tr>
<tr><td rowspan="2">[if a solution is given]
Put 2cm^3 of the solution in the test tube
Add three drops of iodine solution to the solution in the test tube</td><td>The solution turns blue/black</td><td>Starch present</td></tr>
<tr><td>The solution turns brown/yellow</td><td>Starch absent</td></tr>
<tr><td rowspan="2">[if a powder is given]
Put a little of the powder on a clean white tile
Add 3 drops of iodine solution to the powder</td><td>The powder stain blue/black</td><td>Starch present</td></tr>
<tr><td>The powder stain brown/yellow</td><td>Starch absent</td></tr>
<tr><td rowspan="2">[if a leaf is given]
Dip the leaf in boiling water in a beaker for one minute using a pair of forceps. The leaf is dipped in boiling water to kill the protoplasm in order to stop all the chemical reactions (chemical reactions are stopped so that starch is not converted to glucose)
Then take the leaf, roll it up loosely and place it in 20cm^{3}of alcohol in a test tube and boil the leaf for 3 minutes using a water bath to remove chlorophyll. The top of the test tube should be plugged loosely with cotton wool. The leaf appears white when chlorophyll is removed from it before adding iodine solution in order to observe the colour changes or to make a leaf permeable to iodine solution. The water bath is used because alcohol is highly inflammable.
Remove the leaf from alcohol in the test tube and dip it in hot water to make it soft since alcohol makes the leaf brittle.
Spread breached leaf on a clean white tile
Add three drops of iodine solution to the leaf.</td><td>The leaf stains blue / black</td><td>Starch present</td></tr>
<tr><td>The leaf stains brown</td><td>Starch absent</td></tr>
</table>

Test for proteins

Test Method	Observation	Conclusion
[if a solution is given] Put 2cm^3 of the solution in the test tube Add 2cm^3 of sodium hydroxide solution to the solution in the test tube and then add copper(II) sulphate solution drop by drop by while shaking after each drop or Put 2cm^3 of the solution in the test tube Add biuret reagent to the solution in the test tube and shake. ***[if a solid is given e.g. ground nut]*** Crush the solid into smaller pieces to increase the surface area Put the crushed materials in 2cm^3 of distilled water to make a solution in the test tube. Filer the contents of this test tube to have a clear solution. Add 2cm^3 of sodium hydroxide solution to the content in the test tube and then add copper (II) sulphate solution drop by drop while shaking after each drop	The solution turns purple or violet	Proteins present
	The solution remains blue	Proteins absent

Test for lipids / fats

Test method	Observation	Conclusion
1. Emulsion test ***[if a solution is given]*** Put 2cm^3 of the solution in the test tube Add 2cm^3 of ethanol to the solution in the test tube and shake thoroughly to dissolve the fat/lipid and then add three drops of water ***[if a solid is given e.g. ground nut]*** Crush the solid into smaller pieces to increase the surface area Put the crushed materials in 2cm^3 of distilled water in the test tube to make a solution Add 2cm^3 of ethanol to the contents in the test tube and shake thoroughly to dissolve the fats/lipids Filter off the contents of this test tube to have a clear solution Add three drops of water	A white / cloudy emulsion forms	Lipids / fats present
	No white / cloudy emulsion forms	Lipids / fats absent
2. Grease spot / translucent paper mark Press or rub the food sample against the white or khaki strip of paper	A permanent translucent spot/grease spot forms on the strip of paper	Lipids / fats present
	No permanent translucent spot/grease spot forms on the strip of paper	Lipids / fats absent

Test for reducing sugars

Test method	Observation	Conclusion
[if a solution is given] Put 2cm^3 of the solution in the test tube Add 2cm^3 of Benedict's solution to the solution in the test tube and heat the mixture gently.	The solution changes from blue to green, yellow, orange and finally to brick red	Reducing sugars present
[if a powder is given] Dissolve a little of the powder in 2cm^3 of water in a test tube to make a solution Add 2cm^3 of Benedict's solution to the solution in the test tube and heat the mixture gently.	The solution remains blue	Reducing sugars absent

Note

- *If the colour changes from blue to green, it means reducing sugars are present but in very small quantities*

Test for non - reducing sugars

Test method	Observation	Conclusion
[if a solution is given] Put 2cm^3 of the solution in the test tube Add 2cm^3 of Benedict's solution to the solution in the test tube and heat the mixture gently.	The solution remains blue	Non reducing sugars absent
Put 2cm^3 of the solution in the test tube Add dilute hydrochloric acid to the solution in the test tube and heat gently to convert non reducing sugars to reducing sugars Add sodium hydroxide to neutralize the acid Add 2cm^3 of Benedict's solution to the contents in the test tube and heat the mixture gently.	The solution changes from blue to green, yellow, orange and finally to brick red	Non reducing sugars present

Note

- *Sodium carbonate can also be used in place of sodium hydroxide. You should stop adding sodium carbonate when fizzing stops*

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NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Object **X** (regularly shaped rectangular wooden block)
- Electronic balance
- 30cm rule

Method

(a) Measure the mass (m) of object **X**

Mass (m) of object **X** = …… [1]

(b) Measure and record in centimeters, the length, the breadth (width) and height of object **X**.

(I) Length (L) = …… [1]

(II) Breadth (B) = …… [1]

(III) Height (H) = …… [1]

(c) Calculate the volume (V) of object **X** using the formula: V = L x B x H

…… [2]

(d) Calculate the density of object **X** using the formula: $D = \frac{m}{V}$

…… [2]

(e) In your experiment, in which area would you have made a mistake?

…… [1]

(f) State the precaution you took during this experiment

…… [1]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
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TASK NUMBER		DATE	

You are provided with

- Object **X** (stone / ball bearing / pendulum bob)
- Electronic balance
- Thin string
- Measuring cylinder
- Ordinary water placed in the measuring cylinder

In this experiment, you will determine the density of object **X**.

(a) What is meant by the term density?

……
…… [2]

(b) Put object **X** on the electronic balance. Measure and record the mass of object **X** as M

M = …… [1]

(c) State the volume of the water provided in the measuring cylinder. Record it as V_1

V_1 = …… [1]

(d) Tie a thin string around object **X**. Gently, place object **X** completely in the volume of water provided. State the new volume of water in the cylinder. Record it as V_2

V_2 = …… [2]

(e) Work out the volume of object **X** using the formula: $V = V_2 - V_1$

……
……
……
…… [2]

(f) Calculate the density of object **X** using the formula: $D = \frac{m}{V}$

……
……
……
……
……
…… [2]

[Total = 10marks]

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TASK NUMBER		DATE	

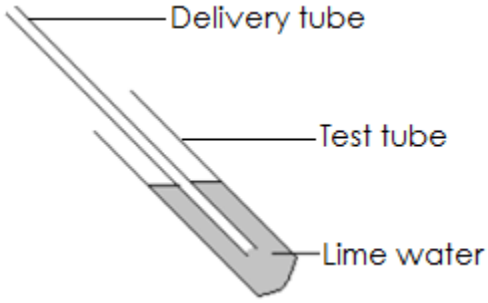
You are provided with

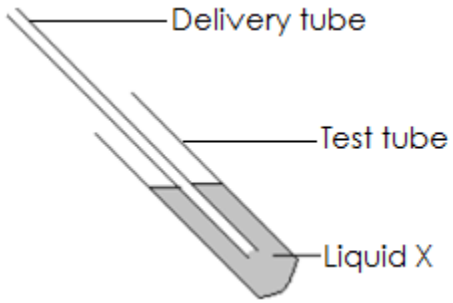
- Lime water in a test tube
- Liquid **X** (Water) in a test tube
- Delivery tube / straw

Method

(a) Pour 3cm^3 of lime water into one test tube and pour 3cm^3 of liquid **X** in another test tube.

(b) Take a deep breath in with the delivery tube NOT dipped into the lime water and then breathe out through a delivery tube or straw into lime water as shown in the diagram below. **Caution: Do not suck the lime water into the mouth.**
Take another deep breath in and then breathe out through another delivery tube into liquid **X**.





Record your observations in the table below:

Observations with lime water	
Observations with liquid **X**	

[2]

(c) Explain your observations in the test with lime water
……
…… [2]

(d) State the name of the gas which is responsible for the change observed in the test with lime water
……
…… [2]

(e) Name the process which occurs in the human body which produces this gas and explain the importance of this process.
……
…… [2]

(f) What is the role of liquid **X** in the experiment?
……
…… [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with the following

Apparatus	**Materials**
Test tube	Detached leaf – W31
Source of heat	Ethanol / Alcohol
Tripod stand and wire gauze	Water
Test tube holder	Iodine solution
Stop watch	Dropper
Beaker	White tile

Method

Examine specimen W31 carefully and record your observations below

(a) Describe W31 in terms of:
- (I) External appearance: ……. [1]
- (II) Texture: …… [1]

(b) Dip W31 in boiling water for one minute using a pair of forceps
- (I) Record any observable changes

  ……..
  …….. [1]

(c) Boil alcohol (20cm^3 of ethanol) in a beaker using a water bath. Put W31 in the boiling alcohol for about 3 minutes
- (I) Record any observable changes

  ……..
  …….. [1]
- (II) Why did you put W31 in boiling alcohol?

  ……..
  …….. [1]

(d) Put W31 in boiling water for about one minute.
- (I) Why did you put W31 in boiling water for one minute?

  ……..
  …….. [1]
- (II) Record the texture of W31

  ……..
  …….. [1]

(e) Spread W31 on a white tile and add 3 drops of iodine solution. Allow the experiments to stand for a few minutes
- (I) Observation: …….. [1]
- (II) Conclusion: …… [1]

(f) Why was the water bath used to boil the alcohol in (c) above?

……..
…….. [1]

[Total = 10marks]

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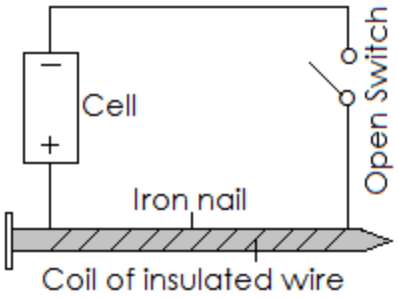
TASK NUMBER		DATE	

You are provided with

- 1.5V cell
- Paper clips
- Large nail
- Cut pieces of copper wire
- Thin insulated copper wire stripped at the ends
- Switch

Method

(a) Wrap the insulated copper wire five times around the nail as tightly as you can. See the diagram below.



(I) Try to pick some paper clips using a nail with the switch open as shown in the diagram above. Record your observations.
…… [1]

(II) Now close the switch and try to pick some paper clips. Record your observations.
…… [1]

(III) With the switch closed, try to pick pieces of copper wire. Record your observations.
…… [1]

(IV) Compare and comment on your results in (II) and (III)
……
…… [2]

(b) Increase the number of turns on the nail to twelve and try to pick some paper clips. What observation have you made?
……
…… [1]

(c) What effect of electric current was being investigated in the experiment?
…… [1]

(d) In which three ways can the effect you have mentioned in (c) above be increased?

(I) …… [1]

(II) …… [1]

(III) …… [1]

[Total = 10marks]

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TASK NUMBER		DATE	

You are provided with

- Beaker
- Measuring cylinder
- Stop watch
- Candle
- Ice
- Water
- Tripod stand
- Source of heat

In this experiment, you will observe the effect of heat on ice and candle wax

Method

(a) Put the ice into a beaker and place the beaker on the tripod stand and heat for 5 minutes. Write your observations

……
…… [2]

(b) Put the candle wax in the candle holder so that it stands upright on the table. Light the candle for 5 minutes. Write your observations.

……
…… [2]

(c) Pour 20cm^3 of water in a beaker and place the beaker on a tripod stand and heat for 10 minutes or more until you see change. Write your observations

……
…… [2]

(d) According to your observations, suggest the name of the process of the change of state that took place in (a), (b) and (c)

(I) Name of process in (a)…… [1]
(II) Name of process in (b) …… [1]
(III) Name of process in (c) …… [1]

(e) What happens to the arrangement of the particles in the process you observed in (a) and (c)?

……
…… [1]

[Total = 10 marks]

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TASK NUMBER		DATE	

You are provided with

- White tile
- Magnifying glass
- D 31 – dicot leaf
- D32 – monocot leaf

Note

- *The two leaves should be of the same size*

In this experiment, you will calculate the magnification of the drawing

Method

(a) Draw a large labelled diagram of specimen D31

[4]

(b) Measure and record the longest part of specimen D31
Longest length of D31 = ……. [1]

(c) Measure and record the longest part of the drawing, then draw a thick line on the diagram of the part you measured. Label this line as L
Longest length of drawing of specimen D31 = ……. [1]

(d) Using the length of specimen D31 and that of the drawing, calculate the magnification of your drawing using the formula,
Magnification = $\frac{\text{Length of Drawing}}{\text{Length of Specimen}}$

[2]

(e) Compare and contrast the features observed on specimen D31 and D32 by writing down:

(I) one difference between D31 and D32
……
…… [1]

(II) one similarity between D31 and D32
……
…… [1]

[Total = 10 marks]

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TASK NUMBER		DATE	

You are provided with the following materials:

- Filter paper, filter funnel, spatula, sand, water, salt, 3 beakers, measuring cylinder and a source of heat

In this experiment, you required to separate a mixture of sand and salt

Procedure 1

- Put a spatula full of sand into a beaker
- To the same beaker, add another spatula full of salt
- Add 20cm^3 of water and stir using a spatula
- Wet the filter paper with water
- Fold a filter paper into a cone and place it in the filter funnel
- Place the filter funnel onto the clean beaker
- Stir the mixture again and gently pour onto the filter funnel
- A colourless liquid will be collected in the beaker. Keep this liquid for use in **procedure 2**

(a) What name is given to this type of separation of mixtures?
…… [1]

(b) Name one application of the separation technique used:
(I) at home
…….. [1]
(II) in industry
…….. [1]

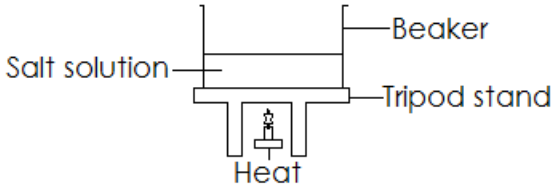
(c) What name is given to the liquid which you have collected in the beaker?
…… [1]

(d) What was the purpose of adding water to the mixture of sand and salt then stirring?
…… [1]

(e) Why did you have to wet the filter paper?
…… [1]

Procedure 2

- Set the apparatus as shown below



- Heat the liquid as shown in the diagram until it has all evaporated

(a) Describe what happens as the liquid in the beaker disappears?
…….. [1]

(b) What name is given to this method of separating mixtures?
…… [1]

(f) Mention any two processes that enabled you to separate the mixture of sand and salt?
(I) …… [1]
(II) …… [1]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

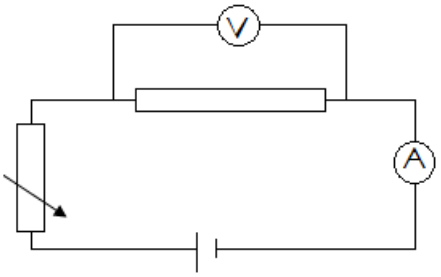
You are provided with

- Voltmeter (of full scale deflection of 5V)
- Ammeter
- Connecting wires with leads
- Variable resistor
- 4 cells each with a voltage of 1.5V
- Circuit board (able to hold 4 cells)
- Switch
- Graph paper

In this experiment, you will investigate the relationship between voltage and current in a conductor

Method

1. Use the materials provided to connect the circuit as illustrated in the diagram below



2. With the switch closed and electromotive force equal to 1.5V, record the readings you observe from the ammeter and voltmeter.
3. Repeat stage 2 by adding cells one at a time until there are four cells in the circuit.
   (a) Record the readings in the table below

Number of cells	Voltage	Current
1		
2		
3		
4		

[4]

(b) Using the data collected,

(I) Plot the graph of voltage against current. [2]

(II) Describe the shape of the graph.

…… [1]

(III) Use your graph to calculate the resistance of the conductor using the formula:

$R = \frac{V}{I}$

……..

…… [2]

(IV) State one precaution you undertook during your experiment

…… [1]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with the following:

- Electronic balance
- Beaker
- Liquid **X** (Water / any liquid)

In this experiment, you will determine the mass of liquid **X**

(a) What is meant by the term mass?

……
…… [2]

(b) Place the empty beaker on the electronic scale and record its mass as M_1

M_1 = …….. [2]

(c) Pour liquid **X** in the beaker and record the total mass of the beaker and liquid **X** as M_2

M_2 = …….. [2]

(d) Find the mass of liquid **X** by using the formula, $M = M_2 - M_1$

……
……
……
…… [2]

(e) State one precaution you undertook during your experiment

……
…… [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Clay or beads of different colours
- Sticks or strolls
- Water
- Colours or any other coloured pigments

In this experiment, you will demonstrate the formation of simple molecules using models

Method

1. Make models of the following molecules
   - Oxygen, O_2
   - Water, H_2O
   - Carbon dioxide, CO_2
   - Hydrogen, H_2
2. Mould balls from clay of different sizes for each of the elements (each ball should have a hole drilled in it using the stick or straw)
3. Colour the elements, each should have its own colour
4. Using sticks or straws, join the balls to make the molecules

(a) What does the colour of each ball represent?

…….. [1]

(b) What do the sticks joining atoms in a molecule represent?

…….. [1]

(c) Which molecules are formed by:

(I) Same kind of atoms

……
…… [2]

(II) Different kinds of atoms

……
…… [2]

(d) Arrange the following atoms according to their size (starting with one with the smallest size)
Carbon, hydrogen, oxygen, chlorine

…… [1]

(e) Draw the structure of the molecules you have made using the clay balls

[3]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

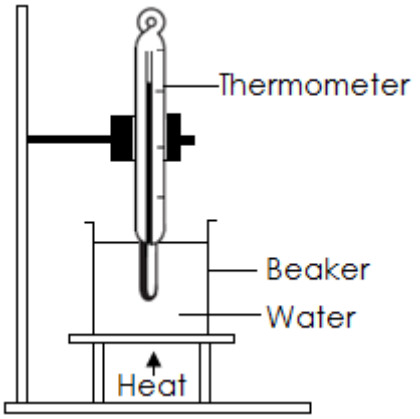
MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Thermometer (−10°C to 110°C), Source of heat, 250cm^3 beaker, Clamp stand, Tripod stand, 100cm^3 of water, Stop watch

In this experiment, you are required to determine the change in temperature of water during heating and cooling. The experiment has been set up for you as shown below



(a) Record the temperature of water before heating

…… [1]

(b) Place the source of heat provided at the bottom of the beaker and record the temperature change every minute for at least six minutes.
Enter the results in the table below

Time / minutes	1	2	3	4	5	6
Temperature / °C						

[2]

(c) How did the temperature of the water change a you heated the beaker?

……..... [1]

(d) At what point did the temperature stop changing?

…….. [1]

(e) Suggest the reason why the temperature stopped changing at this point even after continuing heating the water

…… [1]

(f) State the method of heat transfer from water to the thermometer

…… [1]

(g) Remove the source of heat from the beaker and record the temperature change every minute for at least six minutes. Enter the results in the table below

Time / minutes	1	2	3	4	5	6
Temperature / °C						

[2]

(h) State one precaution you took in this experiment

…… [1]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Onion
- Glass slide
- Iodine solution
- Water
- Razor blade
- Microscope

In this experiment, you will use a microscope to examine the structure of a plant cell

Method

1. Peel a piece of thin layer of from the onion. Place it carefully on a glass slide
2. Add two drops of drops of iodine to the specimen and place the specimen on the stage of the microscope.
3. Turn the adjusting knob to focus the image clearly
4. Observe the different parts of the plant cell

(a) Draw the structures of the cell that you see under the microscope and label the following: nucleus, vacuole, cell membrane, cell wall and cytoplasm

[5]

(b) State the functions of following parts:

(I) Nucleus

…… [1]

(II) Vacuole

…… [1]

(III) cell membrane

…… [1]

(IV) cell wall

…… [1]

(V) cytoplasm

…… [1]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

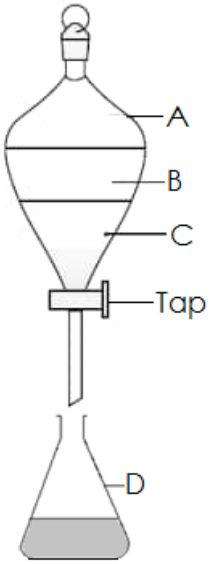
You are provided with

- Apparatus A
- Apparatus D
- Water
- Cooking oil

In this experiment, you will separate a mixture of water and cooking oil

Method

1. Mix cooking oil and water. Shake well and poured the mixture in apparatus A.
2. Allow the mixture to settle for about five minutes.
3. Two layers are formed, that is, a layer of water and a layer of cooking oil.



(a) What name is given to the apparatus marked A?

..... [2]

(b) Identify the layers marked B and C

(I) Layer B: ..... [1]

(II) Layer C..... [1]

(c) What name is given to the apparatus labelled D?

..... [2]

(d) Give the type of mixture separated using the method shown above.

..... [2]

(e) Explain how a mixture is separated using the method shown above.

.....

..... [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

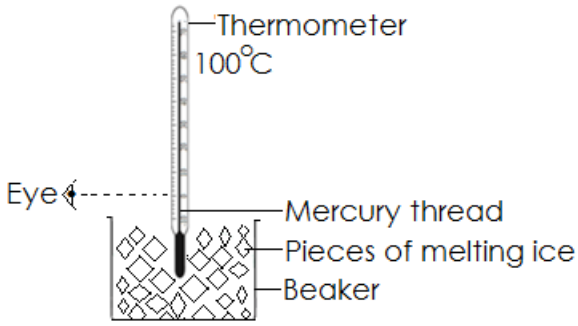
You are provided with

- Thermometer
- Beaker
- Ice cubes

In this experiment, you will investigate the effect of heating ice

Method

1. Put the ice cubes in the beaker
2. Place the thermometer bulb in the ice.



(a) What is the reading on the thermometer?

……
…… [2]

(b) What must be done to the melting ice for it to completely change to the next state of matter?

……
…… [2]

(c) Describe the change of state that the ice will undergo in question (b) above

……
…… [2]

(d) What term is used to describe the temperature at which ice changes its state?

……
…… [2]

(e) Some substances can change from solid state into gaseous state without becoming a liquid. What term is used to describe such a reaction?

……
…… [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

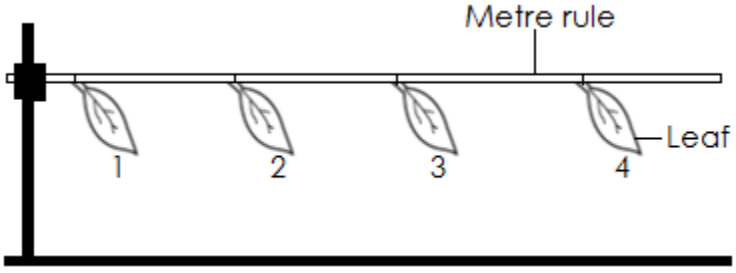
You are provided with

- Four fresh leaves of the same size from the same plant
- Cotton thread
- Vaseline
- Metre rule
- Clamp and stand
- Cello tape
- Pair of forceps
- Two equal pieces of cobalt chloride paper

In this experiment, you will prove that plants loss water through the leaves by transpiration

Method

1. Fix the metre rule onto the clamp stand
2. Tie the leaves with the cotton thread and let them hang on the meter rule well-spaced from each other as shown in the diagram below



3. Smear some Vaseline on the shiny surface of the first leaf
4. Smear the second leaf with Vaseline on the dull surface only
5. Smear the third leaf with Vaseline on both surfaces
6. Do not smear any Vaseline on the fourth leaf
7. Leave the whole set by the side of a window for a period of not less than 24 hours.

(a) What was the purpose of smearing Vaseline on some surfaces of the leaves?

……
…… [2]

(b) Why was one leaf left without Vaseline?

…… [2]

(c) How do you tell that a leaf has lost a lot of water?

……
…… [2]

(d) Why did leaf 1 and 2 lose different amounts of water?

……
…… [1]

(e) From your observations, which surface of a leaf has more stomata?

……
…… [2]

(f) What do we call the process by which plants lose water through stomata?

……
…… [1]

[Total = 10 marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

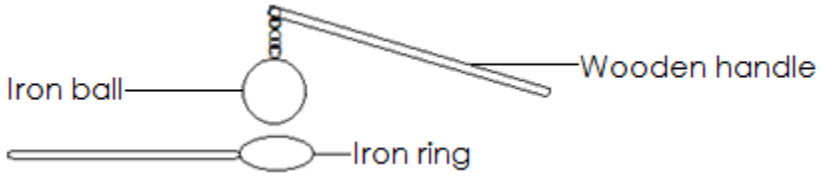
TASK NUMBER		DATE	

You are provided with

- Ball and ring apparatus
- Source of heat

In this experiment, you will investigate the effect of heating solids

Method



(a) Try to pass the ball through the ring
What happens?

……
……
…… [2]

(b) Heat the ball for five minutes.

(I) Try to pass the ball through the ring again.
What happens?

……
……
…… [2]

(II) What do your observations tell you about the effects of heating solids?

……
……
…… [2]

(c) Cool the ball in cold water.

(I) Try to pass it through the ring again
What happens?

……
……
…… [2]

(II) What do your observations tell you about the effects of cooling solids?

……
……
…… [1]

(d) Suggest why the handle attached to the ball is made up of wood

……
……
…… [1]

[Total = 10 marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

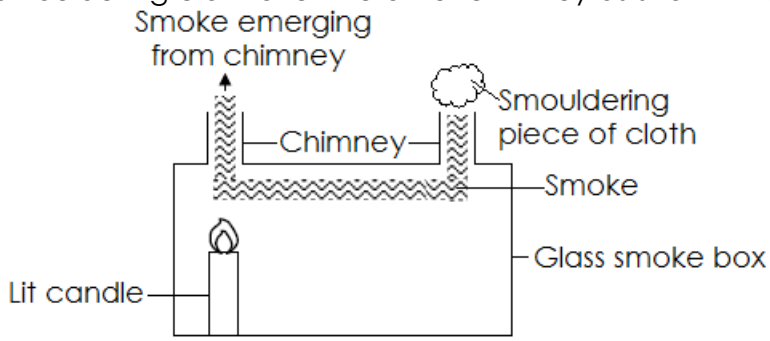
You are provided with

- Glass smoke box
- Candle
- Piece of cloth
- Matches

In this experiment, you will demonstrate heat transfer by convection in air

Method

1. Light the candle
2. Place the candle below one chimney inside the smoke box
3. Light a piece of cloth and allow it to smoulder
4. Hold the smouldering cloth over the other chimney as shown the diagram below



(a) In which direction does the smoke move?

……
……
……
…… [2]

(b) Why did the smoke move in this direction?

……
……
……
…… [2]

(c) What does the movement of smoke suggest?

……
……
……
…… [2]

(d) State two precautions you took in this experiment

(I) ……
…… [2]

(II) ……
…… [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

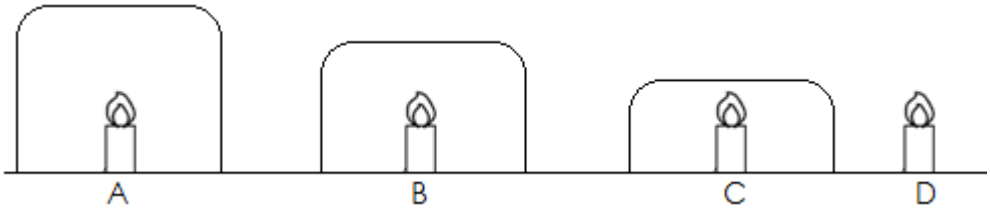
TASK NUMBER		DATE	

You are provided with a box of matches, three different sized beakers, a long candle, stop clock

In this experiment, you will determine how long a candle will burn in an enclosed space

Method

1. Cut a long candle into four equal pieces, and remove some of the wax from each piece to leave a good sized wick. Make sure the wick is the same length on all four pieces.
2. Place the candle in a line and label them A, B, C and D



3. Light candle **A** and **D**. Cover candle **A** with the largest beaker and at the same time start the clock. Stop the clock when the candle flame goes out. Record the time taken for the flame to go out.
4. Light candle **B** and cover it with the smaller beaker and at the same time start the clock. Stop the clock when the candle flame goes out. Record the time taken for the flame to go out.
5. Light candle **C** and cover it with the smallest beaker and at the same time start the clock. Stop the clock when the candle flame goes out. Record the time taken for the flame to go out.

(a) Record the results in the table below.

Candle	Time taken for flame to go out
A	
B	
C	
D	

[4]

(b) In which beaker does the candle burn for the shortest time?

..... [1]

(c) In which beaker does the candle burn for the longest time?

..... [1]

(d) What happens to candle **D** in the experiment?

..... [1]

(e) Why did the candle flames go out at different times?

..... [1]

(f) Why did candle **D** stay burning?

..... [1]

(g) What do you conclude from this experiment?

..... [1]

[Total = 10 marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

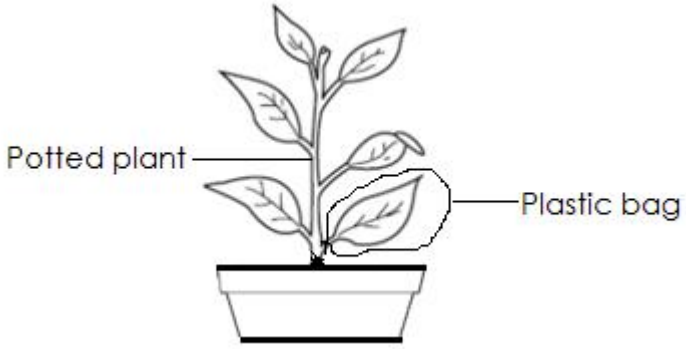
You are provided with

- Transparent plastic bag
- Potted plant

In this experiment, you will prove that plants loss water through the leaves by transpiration

Method

1. Enclose the a leaf of the potted plant with a clean, dry transparent plastic bag and tie the mouth of the plastic bag around the branch of the plant as shown below.



2. Leave the set up for 2 hours in the sun.
3. Examine the inside of the plastic bag

(a) What did you observe inside the plastic bag?

……..
……..
…….. [2]

(b) Explain these observations

……..
……..
…….. [2]

(c) How can you confirm the products in the bag?

……..
……..
…….. [2]

(d) Design a control experiment for the above

[4]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

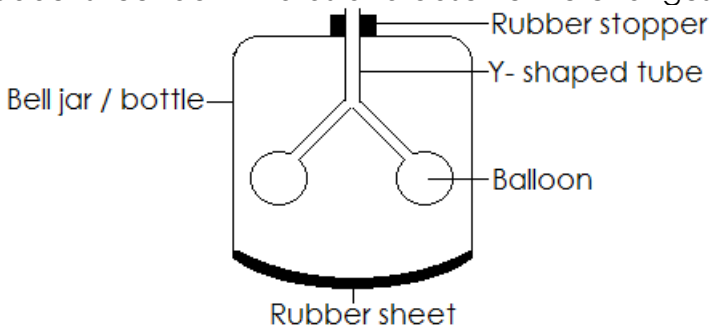
You are provided with

- Y- shaped glass tube, bell jar / bottle / plastic bag, two rubber bands, rubber sheet, string, pair of scissors, rubber stopper, two balloons, rubber stopper with a hole in the middle to fit the bell jar

In this experiment, you will use a bell jar model to demonstrate inhalation and exhalation.

Method

1. Using the string, tightly tie the balloons to the ends of the Y glass tube
2. Fix the rubber stopper into the neck of the bell jar by pushing the Y shaped tube up through the bottom of stopper
3. Tie the rubber sheet onto the bottom of the bell jar
4. Push the rubber sheet upwards and observe the changes
5. Push the rubber sheet downwards and observe the changes



(a) What happens to the balloons when the rubber sheet is pulled down?
…… [1]

(b) What happens to the balloons if you push the rubber sheet up into the bell jar?
…… [1]

(c) Compare the model with the chest.

(I) What does the bell jar represent?
…… [1]

(II) What does the long tube represent?
…… [1]

(III) What do the two branches of the Y tube represent?
…… [1]

(IV) What do the two balloons represent?
…… [1]

(V) What does the rubber sheet represent?
…… [1]

(VI) Explain the observations you made when the rubber sheet was pulled up and down
……
…… [3]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Wires
- Sticky staff
- Hard cover paper

In this experiment, you will construct the structure of an atom

Method

1. Make models of the following:
   - Nitrogen 7 electrons
   - Sodium 11 electrons
   - Fluorine 9 electrons
   - Aluminium 13 electrons
   - Chlorine 17 electrons
2. Use wires for shells, hard cover paper for electrons and sticky stuff to stick the electrons on the shells
3. Always start with filling the first shell, then second and then third. The first shell should only have 2 electrons, the second and third shells should not exceed 8 electrons.
   (a) Name at least two atoms with the same number of electrons in the second shell
   (I) …….. [1]
   (II) …….. [1]
   (b) Which atom:
   (I) Had the least number of shells. Give a reason for your answer
   ……
   …… [2]
   (II) Had the largest number of shells. Give a reason for your answer
   ……
   …… [2]
   (c) What is the relationship between number of electrons and number of shells?
   ……
   …… [2]
   (d) What is the relationship between the number of shells and size of an atom?
   ……
   …… [2]

[Total = 10 marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Two potted plants of the same size and species
- Card box painted black inside

In this experiment, you will demonstrate the effect of light on the stem

Method

1. Place the plants on the shelf in the laboratory near a narrow window
2. Cover one of the plants with a cardboard with a hole facing the window. Leave the plants for three days
3. After three days, remove the cardboard and observe the plants
   (a) Draw the two observed potted plants

[4]

(b) What can you conclude from your observations?

……..
……..
…….. [2]

(c) Explain the purpose of leaving the other plant uncovered?

……
……
…… [2]

(d) What is meant by the term phototropism?

……
……
…… [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Two beakers / glass bottles
- Red / blue ink or any dye / potassium permanganate
- Chalk particles
- Scalpel or razor blade
- Two small plants e.g. black jack (*Biden pilosa*)
- Hand lens
- Water

In this experiment, you show that plants absorb water and mineral salts

Method

1. Pour 300ml of water into the two beakers
2. Add 3 drops of red / blue ink or 3 crystals of potassium permanganate into one beaker
3. In each beaker, carefully place one plant of the same type and size
4. Place the two beakers on the window sill in the classroom or preferably in a well-lit place. Allow the beakers to stand for 2 hours
5. Remove the plants from each beaker and place them on the a white tile
6. Using a razor blade, cut the cross section of the tap root. Using a hand lens, observe the cut surfaces (see figure 1)
7. Using a razor blade, cut the cross section of the stem. Using a hand lens, observe the cut surfaces. (see figure 2)

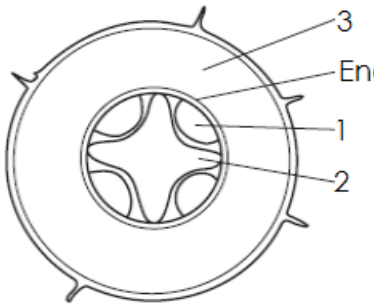

Figure 1

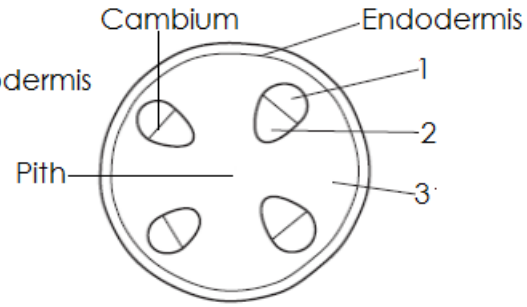

Figure 2

(a) Identify the parts labelled 1, 2 and 3

(I) 1: ..... [2]

(II) 2: ..... [2]

(III) 3: ..... [2]

(b) What conclusion can you make from the observations in figure 1 above

.....

..... [2]

(c) What conclusion can you make from the observations in figure 2 above

.....

..... [2]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Ammeter
- Permanent bar magnet
- A4 sheet of paper
- Insulated copper wire
- Sticky staff / cello tape or glue

In this experiment, you will investigate the conversion of magnetic energy into electrical energy

Method

1. Make a cylinder using a sheet of paper and sticky stuff / tape or glue.
2. Make a coil by winding the insulated copper wire around the paper cylinder
3. Connect the copper wire coil to the terminals of the ammeter. Hold the magnet and move it in and out of the coil.
4. Observe what happens to the needle of the ammeter as you move the magnet in and out of the coil

(a) Draw a diagram to show the set-up of the experiment

[6]

(b) Explain what happens to the needle of the ammeter as you move the magnet in and out of the coil

……
……
……
……
……
……
……
…… [4]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- A syringe
- Beaker
- Water
- Thermometer
- Source of heat
- Stop watch
- Graph paper

Method

In this experiment, you will investigate the effect of temperature and volume on pressure

1. Put water in the beaker and take its initial temperature. Take note the volume of air enclosed in the syringe.
2. Put the syringe in the beaker and warm the water. Take note the temperature and the volume of air enclosed in the syringe every 2 minutes.
3. Observe and record your observations in the table below

Time / minutes	Temperature / ^oC	Volume of air in cm^3
0 minutes		
After 2 minutes		
After 4 minutes		
After 6 minutes		
After 8 minutes		

[4]

(a) Plot a graph of volume against temperature [3]

(b) Describe the changes in the volume of air as the temperature increases

……
……
……
…… [2]

(c) What is your conclusion?

……
……
…… [1]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Seeds (e.g. maize or sunflower)
- Organic fertilizers
- Inorganic fertilizers
- Three pots
- Soil
- Meter rule
- Source of water

In this experiment, you will show the effect of organic and inorganic fertilizers

Method

1. Place an equal amount of the top soil collected from the same point and mix thoroughly
2. Water the three pots with an equal amount of water
3. Plant the seeds at the same depth in the three pots
4. Label the three pots e.g. organic, inorganic and control
5. Water the plants every after one day
6. To each potted plant:
   (I) Apply organic fertilizer to the pot labeled organic
   (II) Apply inorganic fertilizer to the pot labelled inorganic
   (III) Don't apply fertilizer to the pot labelled control
7. Water the plants at the same time every after 1 day
8. Take measurements of each plant every after 7 days
   (a) Measure the height of each plant every after 7 days
   (b) Count the number of leaves on each plant every after 7 days
9. Repeat steps 8(a) and 8(b) for 28 days
10. Record your observations in the table below:

Plant	Height in cm				Number of leaves				Any other observations
	Day 7	Day 14	Day 21	Day 28	Day 7	Day 14	Day 21	Day 28	
Organic									
Inorganic									
Control									

[10]

[Total = 10 marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with laboratory apparatus labelled:

- A
- B
- C
- D
- E

In this experiment, you required to identify the apparatus used in integrated science.

(a) Identify and state the use of the apparatus labelled

(I) Name of apparatus A: ..... [1]
Use of apparatus A: .....
..... [1]

(II) Name of apparatus B: ..... [1]
Use of apparatus B: .....
..... [1]

(III) Name of apparatus C: .....[1]
Use of apparatus C: .....
..... [1]

(b) Which of the apparatus provided is used

(I) for measuring mass
..... [1]

(II) for measuring current
..... [1]

(c) State any **two** laboratory safety rules

(I) .....
..... [1]

(II) .....
..... [1]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

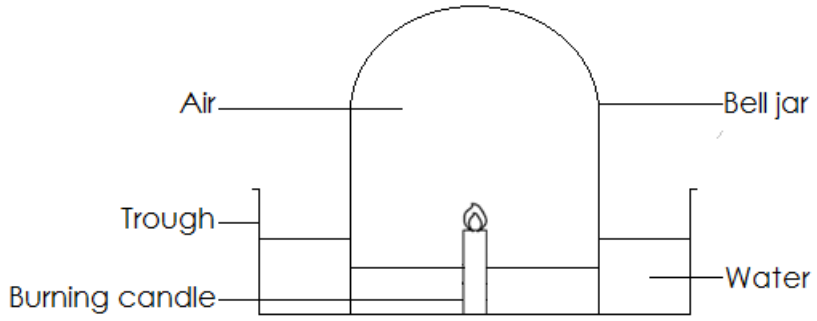
You are provided with

- Candle
- Matches
- Trough
- Water
- Bell jar or big bottle

In this experiment, you will investigate the composition of air. You will also find out how much air is used when a candle burns

Method

1. Fix the candle to the bottom of the trough
2. Pour water into the trough and mark it as initial reading
3. Light the candle
4. Cover the burning candle with the bell jar and observe what happens
5. Mark the new level of water in the bell jar as final reading



(a) Why did the water in the bell jar rise?

……..
…… [2]

(b) Why did the water stop rising after sometime?

……..
…… [2]

(c) Why did the candle flame go off after some time?

……..
…… [2]

(d) Work out the volume of air that was used up

……..
…… [2]

(e) What fraction of the original volume of air in the bell jar was replaced by water?

……
…… [1]

(f) What does the fraction in (e) represent?

……
…… [1]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Convex lens / magnifying glass
- Piece of carbon paper
- Ruler
- Pencil

In this experiment, you will investigate what happens when light passes through a convex lens or magnifying glass

Method

1. Use the lens to focus sunlight on a carbon paper
   (a) Measure the distance between the lens and the spot formed on the piece of paper when light has sharpest intensity to be able to produce smoke or burn the paper
   Distance between lens and spot = ... [1]
   (b) Observe and record what happens to the piece of paper
   .....
   .....
   ..... [1]
   (c) Suggest a reason to explain why the piece of paper burned
   .....
   ..... [1]
   (d) What do you think the brightest spot seen on the piece of paper represents?
   .....
   ..... [1]
   (e) Suggest the name for the distance between the brightest spot and lens
   .....
   ..... [1]
   (f) What happens to the sun rays as they passed through the convex lens?
   .....
   ..... [1]
   (g) Draw a diagram to show the light rays and how the convex lens is used to burn a piece of paper in the experiment

[4]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Beaker
- Zinc metal
- Spatula
- Copper (II) sulphate solution
- Measuring cylinder
- Electronic balance

In this experiment, you investigate the type reaction between zinc and copper (II) sulphate

Method

1. Put 25cm^3 copper (II) sulphate solution in a beaker
2. Add 0.5g of zinc granules to the beaker containing copper (II) sulphate solution while stirring until no further change is observed and remove the excess zinc

(a) Suggest the reason why the colour has changed when zinc was added to copper (II) sulphate

……
…… [2]

(b) State the colour and name of the metal that has settled at the bottom of the beaker

Colour: …… [1]
Name of metal:…… [1]

(c) Suggest the name of the colourless solution formed

……..
…….. [2]

(d) What do you think happened to the

(I) Zinc metal

……
…… [1]

(II) Copper in copper (II) sulphate

……
…… [1]

(e) Write a word equation for the reaction

……
…….. [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

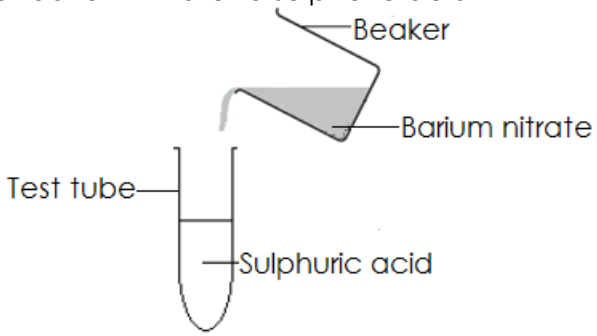
You are provided with

- Test tube
- Barium nitrate
- Sulphuric acid

In this experiment, you investigate the type reaction between barium nitrate and sulphuric acid

Method

1. Pour a little sulphuric acid in a test tube
2. Add equal amount of barium nitrate to sulphuric acid



3. Leave the contents for at least 3 minutes

(a) Write your observations

……
……
…… [2]

(b) What are colours of the two products?

(I) …… [1]
(II) …… [1]

(c) Suggest the names of the products

(I) …… [2]
(II) …… [2]

(d) Write the word equation for the reaction

……
…… [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

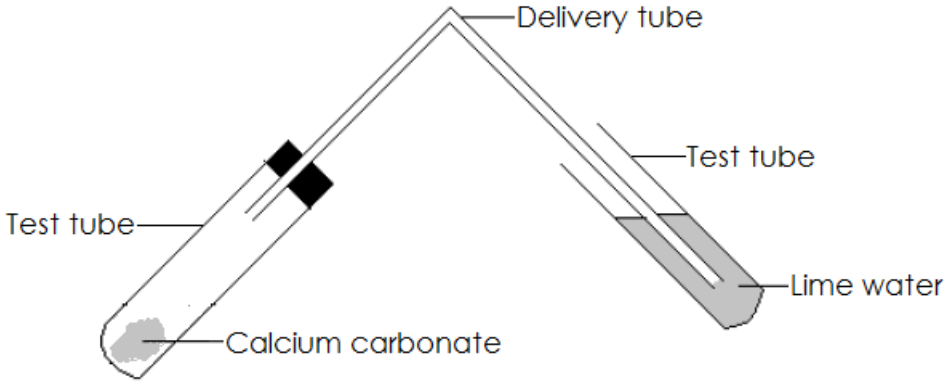
TASK NUMBER		DATE	

You are provided with

- Two test tubes
- Delivery tube
- Calcium carbonate
- Lime water
- Spatula
- Source of heat

Method

1. Using a spatula, place a little amount of calcium carbonate in a test tube
2. Pour lime water in another test tube
3. Heat the test tube containing calcium carbonate
4. Set up the experiment as shown below



(a) Write your observations in the test tube containing lime water

……
…… [2]

(b) Suggest the name of the gas produced

……
…… [2]

(c) What has happened to calcium carbonate after heating?

……
…… [3]

(d) Write the word equation for the reaction

……
…… [3]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Iron (II) sulphate solution
- Sodium hydroxide solution
- Beakers
- Electronic balance
- Measuring cylinder

In this experiment, you will investigate the law of conservation of matter in a chemical reaction

Method

1. Weigh 8cm^3 of iron (II) sulphate solution and record the mass
   Mass of iron (II) sulphate = …… [1]
2. Weigh 8cm^3 of sodium hydroxide and record the mass
   Mass of sodium hydroxide = …… [1]
3. Add the mass of iron (II) sulphate and sodium hydroxide and record as initial mass, M_1, in grams
   M_1 = …… [1]
4. Mix the two solutions together in the beaker and observe the changes that take place. Write your observations.
   ……
   …… [2]
5. Weigh the mass after reacting two solutions and record it as the final mass, M_2
   M_2 = …… [1]
6. Compare the initial (before reaction) and final mass (after reaction)
   ……
   ……
   ……
   …… [2]
7. What conclusion can you make from the results obtained from 6
   ……
   ……
   ……
   …… [2]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Vinegar
- Thermometer
- Baking soda
- Tea spoon
- Plastic cup
- Measuring cylinder

In this experiment, you will identify the nature of chemical reaction between vinegar and baking soda

Method

1. Pour about 10cm^3 of vinegar into a small plastic cup
2. Then, place a thermometer into the vinegar. Record the initial temperature, T_1
   T_1 = …… [2]
3. While the thermometer is in the cup, add about half tea spoon of baking soda to the cup
4. Watch the thermometer for any change in temperature. After it has stopped changing, record the final temperature, T_2
   T_2 = …… [2]
5. Calculate the temperature change for the reaction using the formula: $T = T_2 – T_1$
   ……
   ……
   ……
   …… [2]
6. State whether the reaction is endothermic or exothermic
   ……
   …… [2]
7. Based on the change in temperature in the reaction between vinegar and baking soda, was heat absorbed or given out?
   ……..
   …….. [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Sodium hydroxide solution
- Thermometer
- Hydrochloric acid
- Beaker
- Measuring cylinder

In this experiment, you will identify the nature of chemical reaction between sodium hydroxide and hydrochloric acid

Method

1. Pour about 25 cm^3 of hydrochloric acid in a beaker
2. Then, place a thermometer into the beaker containing hydrochloric acid. Record the initial temperature, T_1.
   T_1 = …… [2]
3. While the thermometer is in the beaker, add 25cm^3 of sodium hydroxide
4. Watch the thermometer for any change in temperature. After it has stopped changing, record the final temperature, T_2
   T_2 = …… [2]
5. Calculate the temperature change for the reaction using the formula: $T = T_2 – T_1$
   ……
   ……
   ……
   …… [2]
6. State whether the reaction is endothermic or exothermic
   ……
   …… [2]
7. Based on the change in temperature in the reaction between sodium hydroxide and hydrochloric acid, was heat absorbed or given out?
   ……..
   …….. [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Blue cobalt chloride paper
- Paper stickers
- Elastic bands / cello tape
- Cover slips / glass slide
- Potted plant (Geranium / coleus)

In this experiment, you will compare the rate transpiration on the lower and upper leaf surface using anhydrous cobalt chloride paper

Method

1. From the potted plant (Geranium) identify two leaves of the same size and label them A and B using paper stickers
2. To leaf A cover the lower surface with cobalt chloride paper
3. To leaf B cover the upper part
4. Attach a blue anhydrous cobalt chloride paper on either side of the leaf surface. Observe any changes and take note the time taken for any change to take place
5. Hold them tightly with a cello tape or elastic band

(a) What changes did you observe on the blue cobalt chloride paper on the lower and upper surface of the leaf?

……..
……..
……..
…… [3]

(b) What conclusion can you make from the observation?

……..
……..
…… [2]

(c) Where is the concentration of the stomata highest on the leaf?

……..
……..
…… [2]

(d) From the experiment, give the possible definition of transpiration

……..
……..
…… [3]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

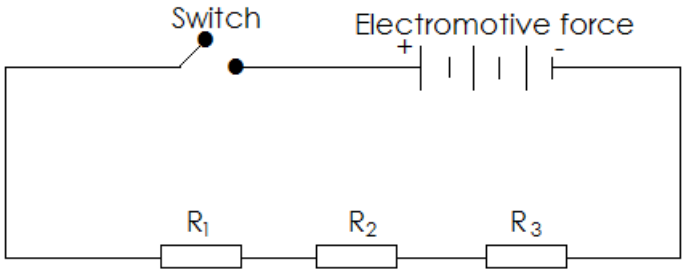
You are provided with

- Connecting wires
- Circuit board
- Voltmeter (full scale deflection of 5V)
- Ammeter
- Switch
- Resistors
- 3 cells each with a voltage of 1.5V

In this experiment, you will find the relationship between the electromotive force supply (V) and the sum of potential difference connected across resistors

Method

1. Using the materials above, investigate the relationship between R and V across the given resistors



2. You are given 3 cells each with a voltage of 1.5V. Calculate the total electromotive force in the circuit

   ……
   …… [2]

3. Find the suitable position where you can connect the ammeter and voltmeter
4. Close the switch and record the final readings on both the ammeter and the voltmeter for each resistor R_1, R_2 and R_3. Record the current and voltage in the table below

Resistor	Voltage	Current
R_1	V_1 =	I_1 =
R_2	V_2 =	I_2 =
R_3	V_3 =	I_3 =

[3]

5. Find the sum of V_1, V_2 and V_3

   ……
   …… [2]

6. Compare the sum of V_1, V_2 and V_3 to the electromotive force supply

   ……
   …… [1]

7. Why is there a difference in the two values obtained?

   ……
   …… [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Triangular prism
- Long narrow cardboard box
- Black / blue A4 paper
- White A4 paper
- Small sharp knife
- Coloured pencils
- Torch light

In this experiment, you will investigate the formation of a spectrum using a prism

Method

1. Prepare the cardboard box making sure that the box is enclosed on all sides except for the top. Cover the inside walls of the box with white paper
2. On one side of the box, make a hole about 5mm close to the bottom of the box
3. Cover the base of the box with either a black or blue paper
4. Darken the room as much as possible. Cover up or switch off all lights sources, except for the one you will use for investigation
5. Place the prism on top of the dark paper on the base of the box. The prism must be in line with the hole that you cut in the end of the box
6. Shine the torch through the hole in the box. Turn the prism slightly until you see the spectrum on the white paper
7. Learners to identify the colours. Using coloured pencils that match the spectrum, draw the triangular prism and trace the light patterns

[2]

(a) What colours have you seen?

…… [2]

(b) Which colours are reflected the most?

…… [1]

(c) Which colours are reflected the least?

…… [2]

(d) What is light dispersion?

…… [1]

(e) What name is given to the band of colours produced when white light is dispersed?

…… [1]

(f) Name the two processes that occur during the splitting of light

(I) …… [1]

(II) …… [1]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

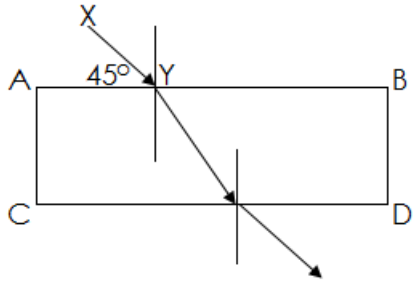
You are provided with

- Pencil, Ruler, Plain paper, Glass block, Drawing pins, Optical board / cardboard, Protractor, Light source

In this experiment, you will investigate the refraction of light through a glass bloc

Method

1. Place a sheet of plain white paper on the optical board / cardboard. On this white sheet of paper, place a glass block as shown below



[6]

2. Use a ruler to find the middle of the longer sides you have drawn, mark all these middle points. Draw a straight line XY, at an angle of 45° to the horizontal line, as shown in the diagram above
3. Mark the points of intersection between this line (XY) and line AB. Call this point Y.
4. Place two drawing pins, P_1 and P_2 along the line XY
5. Replace the glass block into the outline that you have drawn (A, B, C, D)
6. Look into the lower long side of the glass (C,D) so that the image of P_1 and P_2 appear to be in the same line
7. Place P_3 and P_4 below C, D so that the pins are lined up with the images of P_1 and P_2
8. Remove the glass bloc and all the pins. Draw a line through the position of pin P_3 and P_4 until it intersects / touches the line C, D that represents the lower / bottom surface of the glass block.
9. Mark the points of intersection between this line and line C, D. call this point Q.
10. Join the Y and Q with a straight line
11. Repeat for different angles of incidence

(a) Compare the angle of incidence to the angle of refraction

……..
…… [2]

(b) Describe the movement of light from air to glass

……..
…… [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Beaker
- Source of heat
- Tripod stand and gauze
- Water
- Potassium permanganate
- Plastic straw

In this experiment, you will verify how heat travels in liquids

Method

1. Fill a beaker with water
2. Using a straw, drop a few crystals of potassium permanganate to the bottom of the beaker
3. Gently, heat the bottom of the beaker directly under the crystals

(a) Draw the path of potassium permanganate through the liquid at different stages of heating

[6]

(b) Explain what is happening at each stage in your drawing in (a) above

……
……
……
…… [2]

(c) What happens to the potassium permanganate as the beaker is heated?

……
……
……
…… [2]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

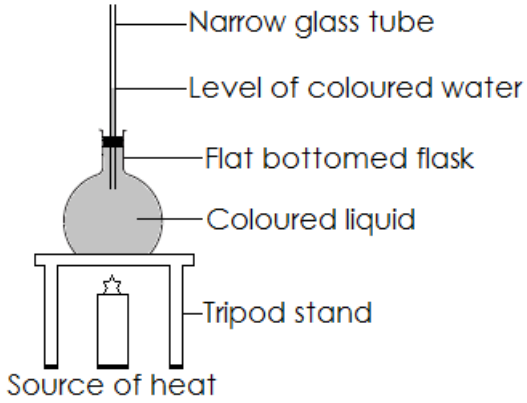
You are provided with

- Flat bottomed flask
- Rubber bung fitted with narrow glass tube
- Tripod stand
- Coloured water
- Source of heat
- Glass tube

In this experiment, you will investigate the expansion of liquids

Method

1. Fill the flat bottomed flask with coloured water.
2. Fit the rubber bung tightly into the mouth of the flask
3. Mark the level of coloured water in the narrow glass tube



4. Heat the bottom of the flask carefully for 3 minutes
   (a) What was your observation in the narrow glass tube as the water was being heated?
   ……
   …… [2]
   (b) What do your observations tell you about the effects of heating liquids?
   ……
   …… [2]
5. Remove the source of heat and allow the flask to cool down and carefully observe
   (a) What was your observation as the water cooled?
   ……
   …… [2]
   (b) What do your observations tell you about the effects of cooling liquids?
   ……
   …… [2]
   (c) Was there a change in the water level during:
   (I) Heating?
   …… [1]
   (II) Cooling?
   …… [1]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

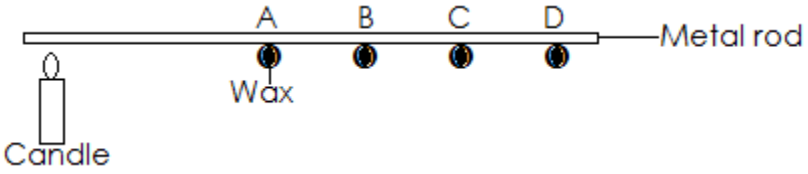
You are provided with

- 30cm metal rod or wire, 30cm wooden stick, Wax, Candle, Matches

In this experiment, you will verify heat transfer in solids by conduction

Method

1. Mark the positions A, B, C and D on both the metal rod and wooden stick as shown below
2. Melt the wax and note the marked positions
3. Heat one end of the metal rod for 2 – 4 minutes



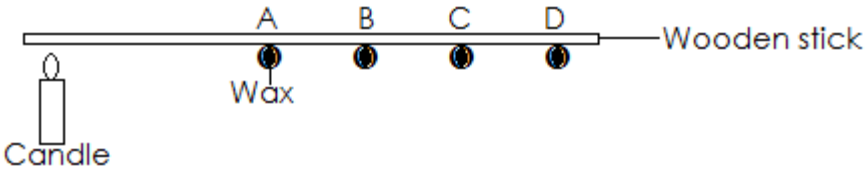
(a) Which wax A, B, C or D melts first? Explain your answer

…… [1]

(b) By what process does the heat reach the wax on the metal rod?

…… [1]

(c) Heat one end of the wooden stick for 2 – 4 minutes



Explain what happens to the wax?

…… [1]

(d) How would you make use of the principle of heat transfer demonstrated by the metal rod and wooden stick in daily life?

…… [1]

(e) State the aim of the experiment where a wooden stick is used

…… [1]

(f) Why does a white car feel cooler inside than a black car when they are parked in the sun for some time?

…… [1]

(g) Between the metal rod and wooden stick, which material is a good or bad conductor of heat?

(I) Good conductor:…… [1]

(II) Bad conductor:…….. [1]

(h) Why does the handle of pot become hot even if is not sitting on the stove

…… [1]

(i) Why do metal spoons have plastic or wooden handles?

…… [1]

[Total = 10marks]

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MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- A metal tin with a lid
- Wax
- Source of heat
- Matches
- Water
- Tripod stand

Method

(a) Place some pieces of wax in the tin and place it on a source of heat as shown in figure 2.

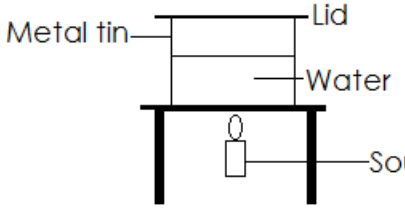


Figure 1

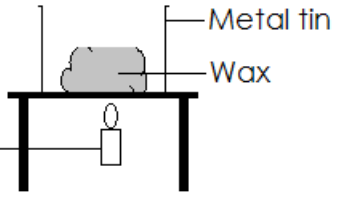


Figure 2

(I) Record your observations after a few minutes

……
…… [1]

(II) State the process that has taken place and state its importance in life

Process: ……
Importance in life:…….. [1]

(b) Leave the tin in figure 2 to cool for 5 minutes

(I) What happens to the wax?

……
…… [1]

(II) What process has taken place?

…… [1]

(c) Repeat the experiment but this time use water in place of wax and cover with a lid as shown in figure 1. Heat the water for a few minutes.

Remove the lid.

(I) What can you observe on the surface of the lid? Explain how this happened

……
…… [2]

(II) Of what use is this process in life?

……
…… [1]

(d) State the aim of each experiment as demonstrated in figure 1 and 2 above

Figure 1: Aim:…… [1]
Figure 2: Aim: …….. [1]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided

- Powdered groundnut
- Strip of paper, S_1
- Strip of paper, S_2
- Distilled water
- Ethanol
- Filter paper
- Test tubes

In this experiment, you will identify lipids / fats in foods

Method

(a) Take a sample of powdered ground nut and press it against one end of a strip of paper labeled S_1. Repeat this action on a second strip of paper labeled S_2.

(I) State what happens to both strips of paper

……
…… [2]

(II) What food test have you just carried out?

…… [1]

(b) Immerse and shake part of S_1 where the powdered ground nut was pressed in 5cm^3 of alcohol for 20 minutes. Remove excess liquid.

Observation (S_1)

……
…… [1]

Reason

……
…… [1]

(c) Immerse and shake part of S_2 where the powdered ground nut was pressed in 5cm^3 of distilled water for 20 minutes. Remove excess liquid.

Observation (S_2)

……
…… [1]

Reason

……
…… [1]

(d) Why was it necessary to shake strips S_1 and S_2 in the liquid?

……..
…….. [1]

(e) What was the purpose of using distilled water in the experiment?

……..
…….. [2]

[Total = 10marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with

- Iodine solution
- Solution X (Water)
- Solution Y (Starch solution)
- Two test tubes

(a) Test solution X and Y for starch and complete the table below.

Solution	Method	Observation	Conclusion
X	Add $2cm^3$ of solution X into a clean and dry test tube. Add 3 drops of iodine solution into the test tube and shake.		
Y	Add $2cm^3$ of solution Y into a clean and dry test tube. Add 3 drops of iodine solution into the test tube and shake.		

[4]

(b) (I) Which solution would you recommend for a manual worker?

……
…… [1]

(II) Give a reason for you answer in (a) above

……
…… [1]

(c) Name any three food staff which contain starch.

(I) …… [1]
(II) …… [1]
(III) …… [1]

(d) State the nutrition deficiency disease caused by lack of carbohydrates in the diet

……
…… [1]

[Total = 10 Marks]

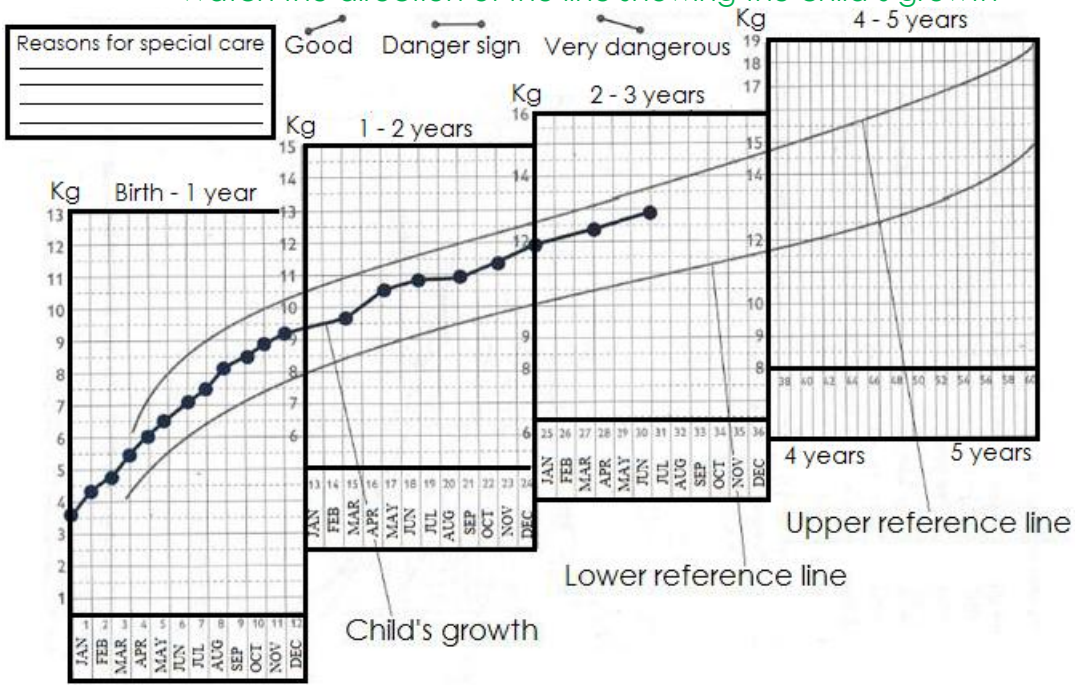
SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

TASK NUMBER		DATE	

You are provided with the Children's Under-Five Clinic Card below

Watch the direction of the line showing the child's growth



(a) What was the maximum age on the card?

…… [1]

(b) During which period was the growth of the child most rapid?

…… [1]

(c) At what age is the child going to experience another rapid growth?

…… [1]

(d) How heavy was the child when he was last weighed?

…… [1]

(e) How heavy was the child when he was six months?

…… [1]

(f) What is the change in weight of the child between the 17th month and 18th month in its second year?

…… [1]

(g) Which period on the card identifies the part which describes "danger Sign" for the child's health?

…… [1]

(h) In what other way can growth of an organism be measured apart from the one shown in the diagram above?

…… [1]

(i) Apart from tuberculosis, name one any other disease that a child is immunized against and the information recorded on the clinic card

Name of disease: …… [1]

Information recorded on the clinic card:……

…… [1]

[Total = 10 Marks]

SN	NAME OF CANDIDATE	EXAMINATION NUMBER	CENTER NUMBER	SEX	CLASS

MINISTRY OF GENERAL EDUCATION
NATURAL SCIENCES DEPARTMENT
INTEGRATED SCIENCE SCHOOL BASED ASSESSMENT

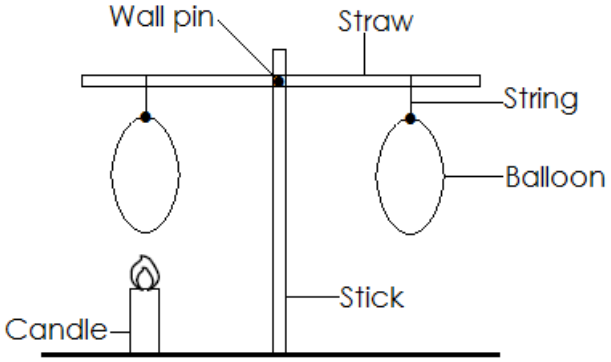
TASK NUMBER		DATE	

You are provided wit

- Candle
- Matches
- Two balloons
- String
- Drinking straw
- Wall pin
- Stick (broom stick, size 40cm – 60cm)

Method

1. Set up the experiment as shown below
2. Inflate the balloons and tie them on a straw
3. Light a candle and place it under one of the balloons



(a) (I) Observe and record what you see

……
…… [2]

(II) Explain your observations

……
…… [2]

(b) If you place an inflated balloon in a cold fridge;

(I) What would you expect to happen?

……
…… [2]

(II) Explain

……
…… [2]

(c) State the aim of the experiment above

……
…… [2]

[Total = 10 Marks]