WUNNA EDUCATIONAL SERVICES

LOWER SECONDARY PHYSICS

LEARNER'S WORK BOOK

1

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Preface

This Learner's workbook has been written in line with the revised Physics syllabus for the new lower secondary curriculum. The revision questions, worksheets and activities of integration have been incorporated into this workbook. The activities of integration together with the 'end of chapter assignments' provided at the end of each chapter will enable the learner to produce new knowledge, values and skills are required in the 21st century.

This has been done by providing a range of activities of integration and assignments which will enable the learner to research more through the internet in order to understand the applicability of knowledge learned at his or her respective school.

The learner is expected to be able to work as an individual, in pairs and groups according to the nature of the activities in order to be able to share learning experiences with their colleagues.

This Learner's workbook is one of the materials which are to be used to support the teaching and learning process of the new lower secondary curriculum.

KATO IVAN WUUNA

Physics and Mathematics tutor

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I welcome any suggestions for improvement to continue making my service delivery better. Please get to me through katoivans001@gmail.com or contact +256788463703 or +256750463703

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THEME 1: INTRODUCTION TO PHYSICS

Chapter 1: INTRODUCTION TO PHYSICS

1.1 Introduction
1.2 Meaning of physics
1.3 Branches of physics
1.4 Carriers in physics
1.5 Role of physics
1.6 Physics laboratory
1.7 General laboratory rules

End of chapter assignment

Activity of integration

INTRODUTION TO PHYSICS

LEARNING OUTCOMES

1. Understand the meaning of physics, its branches and why it's important to study physics.
2. Understand why it's important to have laboratory rules and regulations and the need to follow them.

KEYWORDS

- Science
- Physics
- Matter
- Carrier
- Apparatus
- Laboratory
- Mechanics
- Optics
- Phenomena

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INTRODUCTION

In primary, we learn science as one subject. In secondary school, science is divided into three subjects which are;

- Physics
- Biology
- Chemistry.

In this chapter, we will study the meaning of physics, its branches and why it's important subject.

We shall also that physics, a lot of experiment are carried out in the physic laboratory and why it's important to observe safety in physics laboratory.

2.2 MEANING OF PHYSICS.

The word physics is derived from the Latin word "physica" which means "natural things" therefore physics is defined as the branch of science which deals with the study of matter and its relationship to energy.

Note:

> Matter is anything that occupies space and has weight.

> Energy is the ability to do work.

Activity (group work)

1. Write brief notes on why we study physics.

_____
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2. Discuss the fields in our lives where physics is applied.

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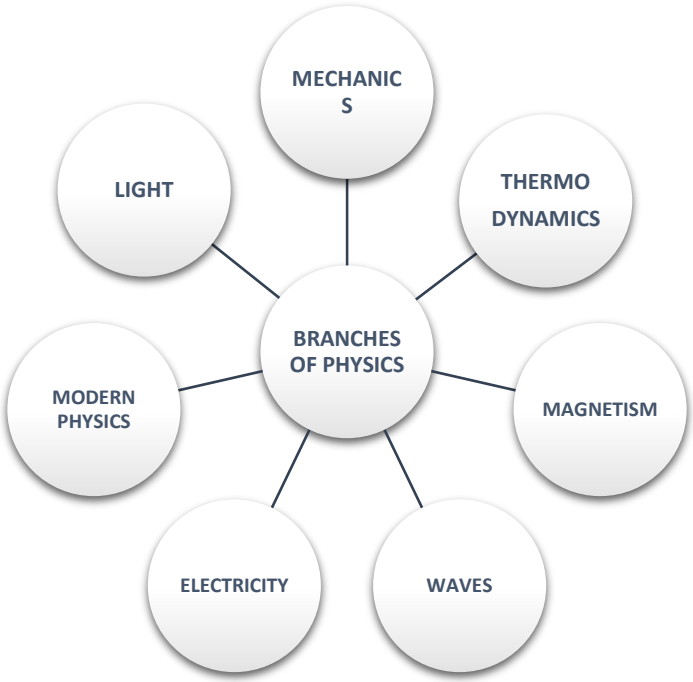
3. What are some of natural occurrences that can be explained by physics?

BRANNCHES OF PHYSICS.

Physics is wide and therefore for better understanding, it is divided into different branches as seen below.



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1. Mechanics and properties of matter.

This deals with the study of bodies in motion (dynamics) and these at rest (statics)

2. Light.

This the study of form of energy that enables us to see. Stars, bulbs, our eyes, mirror, lenses, periscope, telescope, microscope, and many other optical instrument use light in their operations.

3. **Electricity**.

This is the study of charges at rest (electrostatics) and charges in motion (current electricity).

4. Magnetism.

This is the study of properties of metals that attract or repel other metals. Magnets are used in radios, electric bells, microscopes and loud speakers.

5. Heat and thermodynamics.

This deals with how energy is transferred between two points due to temperature difference between them.

6. **Modern physics.**

This deals with the study of the underlying processes of interaction of matter utilizing the tools of science and engineering. It consist of nuclear and atomic physics. Tools such as x-ray machines, cathode ray tubes and nuclear reactors use modern physics to operate.

7. Waves.

This deals with the study of periodic disturbance that carry energy from one point to another without permanent displacement of a medium. Electromagnetic sound waves and light waves are the common examples of waves we use in our lives.

8. Earth and space physics.

This branch deals with the study of the solar system, the stars moon, galaxies, satellites, communication system and the universe in general.

Activity (group work).

1. In your groups identify the branches and explain how they are applied.

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2. Present your findings in the table below

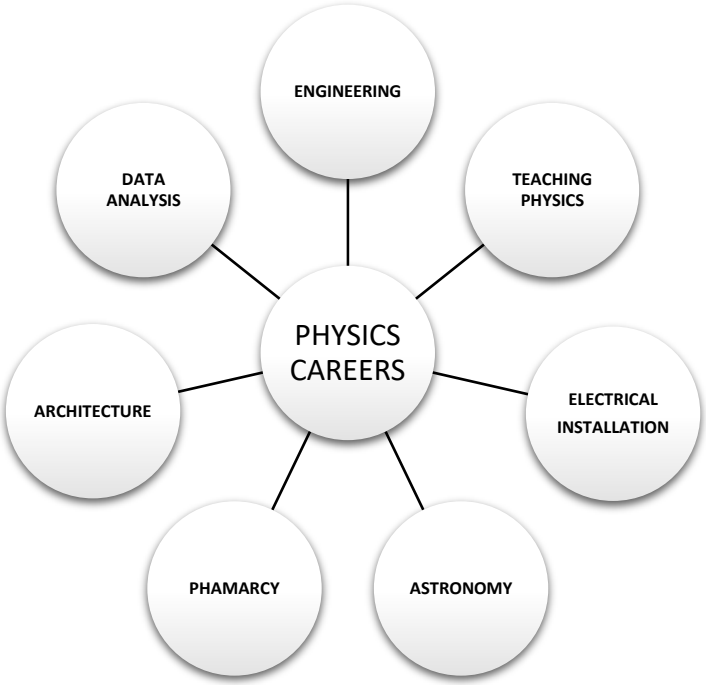
Branch	examples

CAREERS IN PHYSICS

Having studied and understood physics, we can do various jobs.

Activity (Group discussion).

Study the chart below.



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1. Discuss the career shown above, which one are interested in most?

2. List more career that require the knowledge of physics.

3. Discuss how the knowledge of physics is applied in the above listed careers.

4. Present your finding to the class.

2.5 ROLES OF PHYSICS IN OUR SOCIETY.

Physics contributes to the technological development and provides trained personnel with advantage of scientific advances and discoveries.
Physics is an important element in the education of engineers, computer scientists, physics teachers among the others.

Activity

1.Reference to the library or internet, discuss and write notes about the roles of physics in our society.

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2. If technology is misused, it can be of great danger to our society. Discuss and write summary notes about the negative impact of technology.

1.6 THE PHYSICS LABORATORY.

The room in which all the experiment are carried out is called laboratory. Physics being a branch of science, it has a lot to do with testing, experimentation, demonstration, and research. Experiment prove that some statements, law and principle are true.

A laboratory has apparatus used to do research almost on everything.

Activity

Visit a physics laboratory with a pen, note book and pencil.

a) Observe and identify the different equipment (apparatuses).

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b) State the use of each apparatus.

Apparatus	use

c) Suggest the precautions you should observe for your safety and safety of the apparatus.

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d) Using power point, prepare your findings and present to the class

1.7 GENERAL LABORATORY RULES.

Some laboratory equipment are not only delicate but also dangerous, so we need to observe some rules and regulations every time we visit the laboratory in order to prevent accidents from happening and ensuring that that learning physics is both fun and safe.

Activity (Group work)

1. Discuss and make a list of some of the important laboratory rules and regulations.

2. Share your ideas with whole class.

3. With your teacher, make the wall chart of these rules and regulations and display it on the laboratory wall.

Note:
The class rules and regulations are do's and don'ts that every learner in the class must familiar with before undertaking any practical work in the laboratory.

Assignment (describing rules for safety in the laboratory)

1. For each one of rules and regulations that you have identified in your group, discuss and list down the possible accidents that may arise if they are disobeyed.

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2. Make a poster that indicates all that one has to follow to be safe in the laboratory.

Activity of Integration

Your school usually has careers day at the end of the first month of every first term of the academic year.

You have selected from your class to give a speech on that day about physics and the related careers.

Task,

Prepare a five minute speech that you will deliver on that day.
Make sure that your speech is attractive and attract many students to make up careers in physics field.

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End Of Chapter Assignment

1. Define physics

2. List down any four benefits of studying physics.

3. Write down any five careers (occupation undertaken) in Physics.

4. State any four ways we can always commonly apply knowledge of physics while at home.

5. What is meant by the term a laboratory?

6. Write down any four-laboratory apparatus you know in physics.

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7. What other name can you use to replace the word APPARATUS without changing its meaning.

8. What is the laboratory apparatus?

9. List down any four safety precautions/measures taken while in the laboratory.

10. As you moved around your school you must have noticed some other safety precautions / measures taken by the school to ensure safety of the students. Write down any four safety precautions you have noticed in your school.

11. Write down any four laboratory rules and regulations that must be followed while in the laboratory.

12. State reasons why you should follow the laboratory rules and regulations.

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THEME TWO: MECHANICS AND PROPERTIES OF MATTER.

CHAPTER 2: MEASUREMENTS IN PHYSICS

2.1. Introduction

2.2. Estimation and measurements

2.3. Scientific measurements

2.4. Measurements of length

2.5. Measurements of area

2.6. Measurements of mass

2.7. Measurements of volume

2.8. Volume of regular solid

2.9. Volume of irregular solid

2.10. Meaning of density

2.11. Density and its application in sinking and floating

2.12. Density and relative density

2.13. Density and purity

2.14. Measurement of time

2.15. Accuracy in measurements

2.16. Significant figures

End of chapter assignment

Activity of integration

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MEASUREMENTS IN PHYSICS.

LEARNING OUTCOMES

- Understand how to measure and estimate physical quantities; length, area, mass and time.
- Explain how to choose and use the right measuring instruments and select the right unit ensuring accuracy of measuring.
- Appreciate that the accuracy of measurements may be improved by making the several measurements and taking an average value.
- Identify the potential sources of errors in measurement and devise strategies to minimize them.
- Understand the scientific method and explain the steps used in relation to the study of physics.
- Know that practical investigations involve affair test analysis, prediction and justification of results and observations and apply learning in practice.
- Record data in group and charts and look for trends.
- Understand and be able to use scientific notation and significant figures.
- Understand density and its applications to floating and sinking.
- Determine densities of substances and relate them to purity.
- Understand the global nature of ocean current and how they are driven by changes in water density and temperature.

INTRODUCTION

2.1 Measurement is a very important feature in the study and application of physics.

This is because it helps us to determine some of the properties of materials before we use them .in this chapter we shall learn how to estimate and measure physical quantities in standard units, and the importance of making accurate measurement.

2.2 **ESTIMATION AND MEASUREMENTS**.

Measurement is a technique in which the properties of an object are determined by comparing them to a standard. Measurement requires tools and provide scientists with a quantity .scientists use a system of measurement known as the “metric system” or international system of units abbreviated as S.I.

Estimate means using prior and a sound physical reasoning to state a rough idea of a quantity value .estimation is a skill one should have.

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Activity

1. Mention situation where people use estimations in life.

2. Briefly explain how you can estimate.

a) Volume

b) Age of your classmate.

Activity (Group work)

1. In your group, discuss different devices used for measurement of quantities and how they are used and in which units.

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2. Briefly explain how to estimate length and heights.

_____
_____
_____
_____
_____
_____
_____

3. Share your findings with your classmates.

2.3 SCIENTIFIC MEASUREMENTS.

PHYSICAL QUANTITIES.

Anything that can be measured is known as a **physical quantity**. Physical quantity is presented as a numerical value (magnitude) with a unit just like you have a surname and a first name. In general, a physical quantity is characterized by two features namely; size (magnitude) and the unit.
Physical quantities are of two types namely;

- Fundamental quantities
- Derived quantities

FUNDAMENTAL QUANTITIES.

The word fundamental means essential or most important. Fundamental quantities are also known as "**basic quantities** "

Fundamental quantities are physical quantities which are not expressed in terms of other physical quantities.

Examples of fundamental quantities are;

- Length
- Mass
- Time
- Temperature
- Current
- Amount of a substance
- Luminous intensity

DERIVED QUANTITIES.

These are physical quantities which can be expressed in terms of other physical quantities.

Derived quantities are obtained by multiplying or dividing two or more fundamental quantities.

Examples of derived quantities include;

- Area
- volume,
- power,
- density,

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- weight,
- velocity,
- force
- Acceleration.

Activity

In groups, discuss the various measurements of both derived and fundamental quantities. Use your findings to complete the table below.

Fundamental quantity	S.I unit	Symbol for unit
Derived quantity	S.I unit	Symbol of unit

MEASUREMENT OF LENGTH

Length is a measure of distance. The S.I unit for length is metre (m) .other units of length include;

- Millimeters (mm)
- Centimeter (cm)
- Decimeter (dm)
- Decametre (dm)
- Kilometre (km)
- Acres
- Hectares among others.

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There are special instruments for measuring different lengths.

Activity

1.Identifying various instruments used to measure length and where they can be used in daily life.

Instrument	Length it can measure

2.Using internet or library, research and draw a well labelled structure of micrometer screw gauge and the Vanier caliper and explain how they are operated.

STRUCTURE OF A MICROMETRE SCREW GAUGE

HOW IT'S OPERATED

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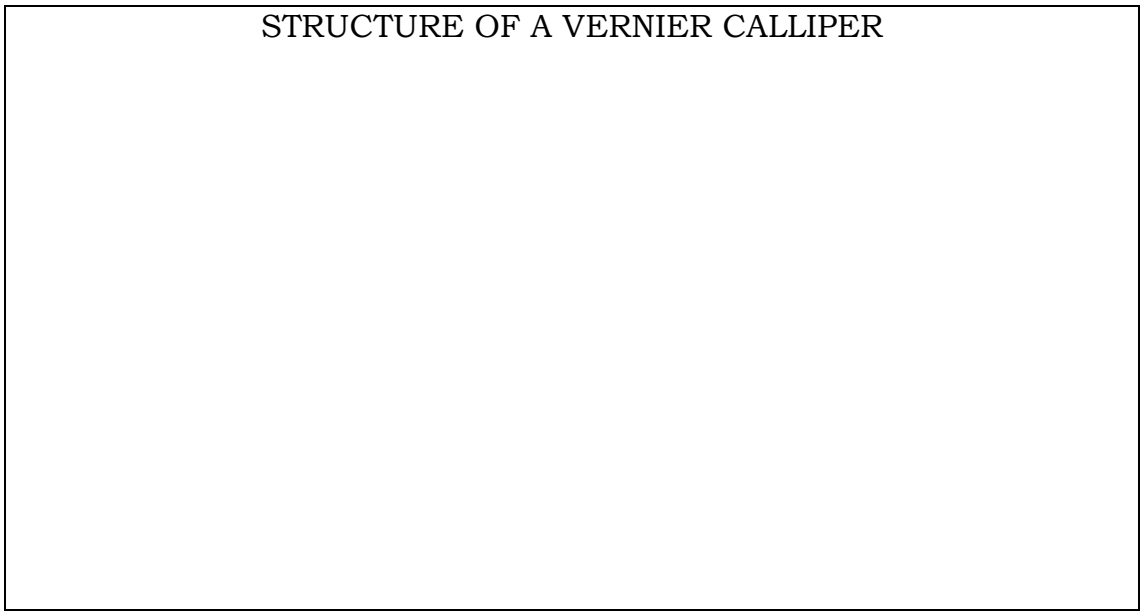
STRUCTURE OF A VERNIER CALLIPER



HOW IT'S OPERATED

CONVERSION OF UNITS.

The S.I unit for measuring length is metre (m). However, in the metric system, length can be expressed in terms of other units as shown in the table below.

km	10^3m
Hm	10^2m
Dm	10^1m
dm	10^{-1}m
cm	10^{-2}m
mm	10^{-3}m

Activity

Convert the following as instructed.

a) 2km to cm

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b) 500cm to Hm

c) 0.02km to m

d) 150mm to m

MEASUREMENTS OF AREA.

All objects occupy a particular two dimensional space called **area**.

Area is measured in square metres (m^2) .the other units of area are; square centimeter (cm^2), square millimeter (mm^2), square kilometer (km^2), square mile (ml^2) , among others.

CONVERSION OF UNITS.

From 1m = 100cm

1m x 1m = 100cm x 100cm

$1m^2$ = $10000cm^2$

From 1km = 1000m

1km x 1km = 1000m x 1000m

$1km^2$ = $1000000m^2$

From 1cm = 10mm

1cm x 1cm = 10mm x 10mm

$1cm^2$ = $100mm^2$

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Activity (Group work)

1. In your groups , use the suitable instruments to measure the length and width of ;

a) The floor of your classroom
b) The blackboard of your classroom
c) Your physics workbook.
d) Obtain the area in each case.

	Length	Width	Area
Blackboard			
Classroom			
Physics book			

Complete the table below.

Shape	Formula of area
Square	
Rectangle	
Triangle	

2. Discuss the difference between cross sectional area and total surface area and list down the formula of determining total surface area of various regular shapes.

_____

_____

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REGULAR SHAPES(draw)	TOTAL SURFACE AREA
1.	
2.	
3.	
4.	
5.	

3. Mr. Wuuna brought an irregular shaped piece of land, explain how you would help him to determine its area.

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MEASUREMENTS OF MASS.

Mass is the quantity of matter contained in the body. The S.I unit of mass is kilogram (kg). The other units of mass are; grams(g), tonnes, milligrams(mg), centigrams(cg), decigrams(dg), among others .

Mass is measured using a beam balance and the electronic mass meter among others.

CONVERSION OF UNITS.

1kg = 1000g
1g = 100cg
1cg = 10 mg
1tonne = 1000kg

Activity

1. Apart from the beam balance and electronic balance, suggest any other devices used to measure mass.

2. Convert the following as instructed

a) 0.25 tonne to kg

b) 200mg to g

c) 50g to kg

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3.Briefly explain how you can determine the mass of milk in a plastic glass.

_____

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MASS AND WEIGHT.

As earlier discussed, mass is the amount of matter an object contains and weight refers to the measurement of the pull of gravity on an object.
Mass becomes weight when an object being measured is suspended and acted upon by the force of gravity. Force of gravity is the force with which the earth pulls objects to itself.

Weight is calculate from;

Weight = mass x acceleration due to gravity

W = m x g

Activity (Group)

In your groups, discuss the difference between mass and weight and share your finding with your class.

Weight	Mass

MEASUREMENTS OF VOLUME.

Volume is the space occupied by the object .the S.I unit of volume is cubic metre (m^3). The volume of the regular object can be determined if we know its dimensions. However, for irregular objects, we use the displacement method or the overflow can.

Activity

In your groups, research and discuss;

a) The other units of volume and the instruments used to measure volume of liquids.

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Units of volume	instrument
1.	
2.	
3.	
4.	
5.	

b) How to determine the volume of ;

1. Water in cylindrical tank

2. 6 – inch nail using a eureka can.

3. A dry piece of wood using a measuring cylinder.

4. Share your findings with the class.

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CONVERSION OF UNITS IN VOLUME.

Note that 1 litre = $1000cm^3$

From 1m = 100cm

Therefore; $1m^3$ = 1000 litres

From 1km = 1000m

$1km^3$ = 1000, 000,000m^3

From 1cm = 10mm

$1cm^3$ = 10mm x 10mm x 10mm

$1cm^3$ = $1000mm^3$

Assignment Activity

1. Convert the following as instructed

a) $200cm^3$ to m^3

b) 50 litres to cm^3

c) $1200m^3$ to mm^3

d) $0.8m^3$ to litres.

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2.Ivan has 30000cm^3 of milk. He sells a litre at 750 shs. Find how much will he earn from the milk.

MEASURE OF TIME.

Time is the interval or duration between two events. The SI unit of time is second (s). Other units of time include minute, hours, days, weeks, month, year, decades, among others.

The common instrument used to measure time are stop watch and stop clock.

Group work Assignment

1.Discuss the instrument you would use to time the following events.

a) A fruit falling from tree.

b) Travelling from Kampala city to Gulu city

2.Convert the following as instructed

a) 2.5 hours to seconds

b) 640 hrs to days.

c) A fortnight to minutes.

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VOLUME OF REGULAR SOLID

There are two types of objects namely;

- Regular objects
- Irregular objects

The volume of regular object is determined using a specific formula if the dimensions of the object are known.

Activity

Using the library or internet, make research and complete the table below.

Object	Shape	Formula for volume
Cuboid		
Cube		
Cylinder		
Sphere		
Rectangle Prism		

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VOLUME OF AN IRREGULAR OBJECT.

Irregular solids are those with undefined shapes for example a stone

We use the displacement method or the eureka can to determine the volume of an irregular object.

Activity

Using the library, research and write the procedures of determining the volume of a stone both displacement method and eureka can method.

1) Displacement method.

2) Eureka can method.

MEANING OF DENSITY.

The density of a material is defined as its mass per unit volume. To determine the density of a substance, we need to know its mass and volume it occupies. The density is calculated from;

$$\text{Density} = \frac{Mass}{Volume}$$

$$D = \frac{M\ (kg)}{V\ (m^3)}$$

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The SI unit of density is kilograms per cubic metre (kgm^{-3}). Sometime density is measured in grams per cubic centimeter(gcm^{-3})

CONVERSION OF UNITS.

$$\frac{1\ kg}{1\ m^3} = \frac{1000\ g}{1{,}000{,}000\ cm^3}$$

$$1\ \boldsymbol{kgm^{-3}} = \frac{1}{1000}\boldsymbol{gcm^{-3}}$$

Multiplying through by 1000

$1000\ kgm^{-3} = 1\ gcm^{-3}$

Assessment activity

1.a) Calculate the density of the brick whose mass is 500g and dimensions are 30cm by 15cm by 10cm.

b) Calculate the mass of air of density 1.29 kgm^{-3} in a room of dimensions 7m by 6m by 4m.

3. convert the following as instructed

a) $15.2gcm^{-3}$to kgm^{-3}

b) $1250kgm^{-3}$ to gcm^{-3}

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2. The following results were obtained in an experiment to determine the density using a density bottle of $75cm^3$.

Mass of an empty density bottle = 35g

Mass of the bottle full of liquid = 75g

Find the density of a liquid.

Assignment (research work)

1. Suggest the uses of density in daily life and state the factors that affect density.

Uses

Factors

2. Carry out a research to find out how to find the density of ;

a) an irregular solid like a stone.

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b) a liquid like water

c) air

d) Discuss your findings in class and carry out experiment to confirm.

DENSITY AND ITS APPLICATION IN SINKING AND FLOATING.

We normally witness objects floating or sinking in different media like water and air. The density of an object determines whether it will float or sink in another substance. An object will sink if it is denser than a liquid it is placed in.

Note; the density of water is $1gcm^{-3}$ or $1000kgm^{-3}$. Those substances with a density of less than that of water will float on water while those substances with density greater than that of water will sink.

Assessment activity

Why do you think large ships or ferries are able to float on water, even though they are made of steel which is denser than water?

Density of water and ocean currents.

Fluctuation in both temperature and salt content lead to different regions of ocean water having different densities. High temperature case a given mass of water to expand and therefore drop in density whereas the lower content of salt cause a given mass to be less dense.

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Gravity causes denser water to fall, pushing away the less dense water which shoot sideways and rise. Giant convection loops of ocean currents forms as the lighter (hotter and less salty) regions of water rise and flow to replace the heavier (colder and more salty) regions of water.

Assignment (group work)

In a group make a comprehensive research and write notes on;

a) How ocean currents are related to the change in density.

b) The possible impact of ocean currents on the warming of the north Atlantic due to climate change.

Using internet and other sources, research about, discuss and make a presentation on what causes;

a) surface ocean current

b) Tidal current

c) Deep water current.

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DENSITY AND RELATIVE DENSITY

Relative density is defined as the ratio of density of a substance to the density of water. Relative density has no units of measurement.

When the relative density of a substance is less than 1, then, it is less dense than water and vice versa. But when the relative density is exactly equal to 1, the density of a substance is equal to that of water.

Assessment activity

1. Explain why relative density has no units

2. Explain why coins sink in water while a pencil float on water.

3. A boat is heavier than 650 coins together, explain why the boat is able to float on water while a coin cannot.

FLOATING AND SINKING IN AIR

It is not liquid that can make things floating. Objects can float in air too

Activity

Research about how a hot air can balloon works, discuss in your groups and write summary notes and share with the class.

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SIGNIFICANT FIGURES

In this section, we are going to learn about rounding off and scientific notation.

Scientific notation is used for writing very large or very small numbers. It helps to reduce errors during writing.

Rules for counting significant figures.

1. All non-zero digits are significant
2. Zeros trapped within non zero are significant e.g. 1203 (4sf)
3. Trailing zero that are not needed to the decimal points are significant e.g. 12.00(4sf)
4. Zeros that do nothing but set the decimal points are not significant e.g. 450 (2sf)

Significant figures of a number are digits that carry the meaning of the measurement and thus contributing measurement resolutions.

When carry out a multiplication or division, the results should be reported to the same number of significant figures as that of the number with minimum of significant figures.

However, for addition and subtraction, the results should be written with the smallest number of decimal places of the number being added or subtracted.

Activity

Workout the following and write your and to the correct number of decimal places and significant figures.

a) 0.4 x 0.25 =

---

b) $\frac{92.15}{9.30}$ =

---

c) 30.15 + 2.12 - 18.5 =

---

d) $(\frac{0.36}{0.2}$ + 12.5 x 0.15) =

ROUNDING OFF

When the answer to a calculation contains too many significant figures, it must be rounded off.

One way of rounding off involves underestimating the answer if the end digit is from 0-4 or overestimating the answer if the end digit is from 5-9.

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The approach is summarized as shown below

a) If the last digit is smaller than 5, drop it and leave the remaining number unchanged e.g. 1.734 becomes 1.73 (2dp)

b) If the last digit is 5 or larger, drop it and add 1 to the preceding digit e.g. 1.567 becomes 1.57 (2dp)

Assessment activity

1. Round off to stated decimal places

a) 2.062 to (2dp)

---

b) 4.586 (1dp)

---

c) 1.9705 (3dp)

---

d) 9.58 (0dp)

---

2. Write the following to stated significant figures.

a) 28.802 (2sf)

---

b) $\frac{2}{7}$ (2sf)

---

c) 4.035×10^{-2} (3sf)

---

d) 9.9998 (3sf)

CONVERTING TO SCIENTIFIC NOTATION

A quantity of the form $\mathbf{a} \times \mathbf{10}^{n}$ is said to be written in scientific notation where a is a positive integer between 0 and 10 and n is an exponent or power or index.

The exponent in scientific notation is equal to the number of times the decimal point must be moved to produce a number between 0 and 10.

For example; Convert 6,070,000 to scientific notation or standard form

In order to convert this number to scientific notation, we move the decimal point to the left until we remain with 6 on a left side of the number i.e.

$$6070{,}000 = 6.07 \times \mathbf{10}^{6}$$

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Note that when converting numbers smaller than 1 into scientific notation, we have to move the decimal point to the right and exponent becomes a negative value. e.g.

$$0.000985 = 9.85 \times \mathbf{10^{-4}}$$

When converting a number bigger than 10 into scientific notation , we have to move the decimal point to left and exponent becomes a positive value . e.g.

$$12 = 1.2 \times \mathbf{10^{1}}$$
$$125 = 1.25 \times \mathbf{10^{2}}$$

Assessment activity

1. Convert each of these numbers to scientific notation.

a) 0.00102

b) 980

c) 101.2

d) 2.018

e) 150,000,000

f) 2004

2. Round off the following g digits and express them to 3 significant figures.

a) 245830

b) 3850

c) 0.08042

d) 1122334

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THE SCIENTIFIC METHOD IN STUDYINY PHYSICS

The scientific method is a process of gathering and refining data, information and knowledge and explain why and how things occur.

Steps involved in a scientific method

There are many forms of the scientific method as there are scientists but general procedure is the same.

Assignment (Group)

1. Using internet or textbooks, discuss the necessary steps required for the scientific method.

2. Write short notes on each of the steps.

3. Present your work to rest of the class

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Activity.

In your groups, follow the steps of the scientific method to carry out the investigation between hot water and tea, which of the two cools faster?

Hint:

- Use equal volume of water and tea.
- Thermometer
- Stop clock or stop watch

Prepare a report of your investigation clearly indicating your; observation, question, research done, prediction made, procedures of the experiment, cooling curve and conclusion

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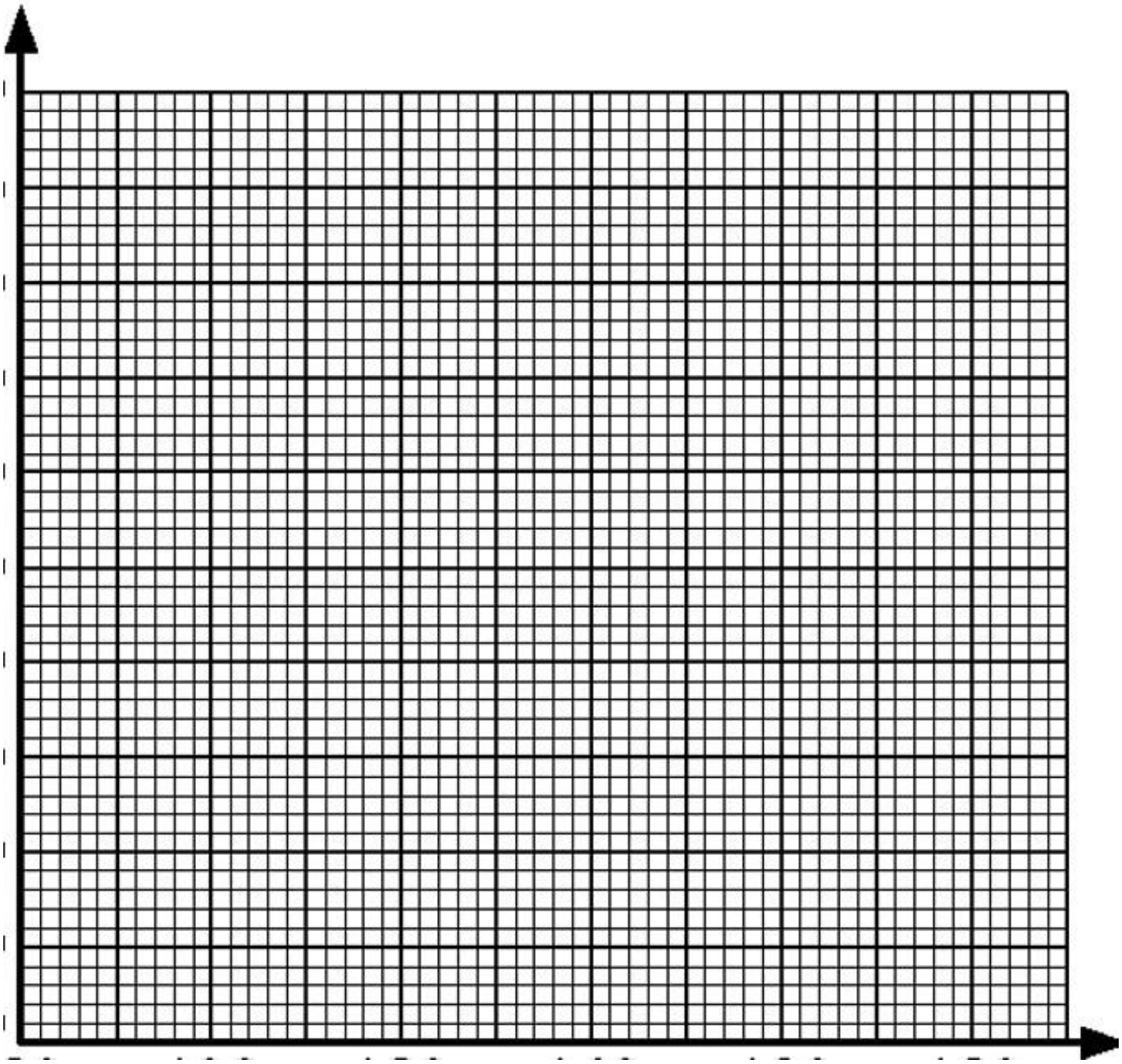
COOLING CURVE



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CONCLUSION

Activity of Integration one

Your father finds a merchant selling what looks like pure gold stones. He buys a few and show to the family because he is not sure whether it is real pure gold. The family assures him that is pure gold hence should buy more and sells to get money but he still doubts.

Prepare a demonstration to prove whether then stones are pure gold or not help your father to clear the doubts.
Hint: density of pure gold is 19.3 $\boldsymbol{gcm^{-3}}$

Activity of Integration two

SCENARIO

Some bottles of colorless liquids were being labeled when the technicians accidentally mixed them up and lost track of their contents. **15. 0** $\boldsymbol{ml}$ sample withdrawn from one bottle weighed**22.3 g**. The technicians knew that the liquid was either acetone, benzene, chloroform, or carbon tetrachloride. He however has challenges identifying the right chemical to label.

SUPPORT MATERIAL

LIQUID	Acetone	Benzene	Chloroform	water	Carbon-tetrachloride
DENSITY ($\boldsymbol{g/cm^3}$)	0.792	0.899	1.489	1.000	1.595

TASK

a) What was the identity of the liquid? (Clearly show each step of your work out)

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b) Name those liquids which can float on water and explain why they float on water.

a) Name those liquids on which water floats on top and explain why water floats on those liquids named.

END OF CHAPTER ASSIGNMENT

1. What do you understand by the term Measurement?

2. What do you understand by the term Estimation?

3. Peter said that he is 2 meters tall, his younger Philip doubted him and they began arguing over it, so to stop the endless argument Philip got the tape

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measure and measured Peter height, he found out that he is 1.7 meters instead.

a) Which physics term can be used to represent 2 meters tall?

---

b) Which physics term can be used to represent 1.7 meters tall?

_____

c) What is the difference between the above two physics terms?

_____

_____

_____

_____

_____

5. During class activity, the students were tasked to find the length of their classroom. Denis used his foot span and found out that the classroom length is 50-foot spans meanwhile Job went to the laboratory and got a tape measure to which he used and obtained 12 meters.

a) Why do you think there are differences between the values obtained by the two students?

_____

_____

b) Which of the two values obtained is an estimated value?

_____

_____

c) Which of the two values obtained is the actual value?

_____

_____

d) Who obtained the actual value of the length of classroom?

_____

_____

e) How can we improve the reliability of an estimate?

_____

_____

6. “Length of a football pitch is a fundamental physical quantity whereas Area of the same football pitch is a derived quantity”. Said the teacher

a) Briefly explain what this statement means.

_____

_____

_____

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b) Name any other four fundamental quantities you know.

_____

_____

_____

c) Name any other four derived quantities you know.

_____

_____

_____

d) What is the main difference between these two quantities?

_____

_____

_____

_____

7. Given the following measuring instruments in the table below, you are required to identify the right instrument for measuring or estimating the physical quantities (tasks) in the table. In each case allocate the right **standard unit** of measurement used.

INSTRUMENT	**TASK**
Tape measure	The thickness of a laptop
Metre rule	The time it takes to run a race
Vernier calliper	The width of the classroom
Stop clock	The length of a football pitch
Micrometer screw gauge	The area of the classroom
Stop watch	Diameter of a very small tube

Tape measure:

_____

Metre rule:

_____

Vernier caliper:

_____

Stop clock:

_____

Micrometer screw gauge:

_____

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Stop watch:

_____

8. Six different groups of students were given research work on school project about finding the length and width of a standard football pitch. Since each group worked independently, they ended up presenting their research findings in different units as shown in the table below

GROUP	**A**	**B**	**C**	**D**	**E**	**F**
LENGTH	11Dm	11,000cm	120,000mm	0.1km	0.9Hm	1000dm
WIDTH	7Dm	7,000cm	80,000mm	0.06km	0.45Hm	550dm

a. As the student coordinator in the school help your friends from different groups to work together by using standard unit of measurement of length for all groups.

_____

_____

_____

_____

_____

_____

_____

_____

b. Show how you can obtain the most accurate measurement of the football pitch from the results obtained from all the above groups.

_____

_____

_____

_____

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c. What physics term do we use to mean the difference between the actual value and the apparent value?

d. Briefly explain two reasons why you think different groups obtained different values after the measurement.

9. What do you understand by the terms area and volume of a body?

10. What is the S.I unit of area and volume respectively?

11. What do scientists mean when they say surface area? How about cross-sectional area? (You may use illustrations)

Surface area	Cross- sectional area

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12. Mr. Kyobe went to buy a carpet for his bedroom that measures 10m by 60m. What size of the carpet should he buy in?

(a) **m^2**

(b) **cm^2**

(c) **km^2**

13. Your father wants to buy an irregular shaped plot of land but he fears that he may spend a lot of money than usual because he doesn't know how to obtain the actual value of the land without knowing its actual size. Briefly explain the steps you would follow to help him determine the area of the plot of land so that he doesn't get cheated. (Include illustrations).

Illustrations

Explanation

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14. Fred sells water in a **20 *litre*** jerrycan at UgShs.200 per jerrycan. One day he was paid Ug. Shs. 15,000 by one of his customers who wanted to buy water.

(a) What physics term can be used to replace the sentence, "the space occupied by water in a jerrycan?

(b) How much water should Fred sell to his customer?

(c) Name any other two common units used in measuring the amount of space occupied by an object.

(d) What is the relationship between those units in (c) and the unit used by Fred?

15. To measure the volume of a coin, water is taken in a measuring cylinder to a level 15.0 ml. On immersing the coin in it, the water level in measuring cylinder rises to 16.7 ml. What is the volume of coin? Express your result in S.I. units.

16. Kato has a mass of 50kg on earth whereas his weight is 500N on earth.

(a) What is the mathematical relationship between mass and weight?

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(b) What does the term mass mean? What is its SI unit?

(c) What does the term weight mean? What is its SI unit?

(d) When Kato went to the moon, his weight changed from 500N to 81N but to his surprise his mass did not change at all. Briefly explain that scenario.

(e) Write down any three key differences between mass and weight of a body?

Mass	Weight

(f) A car has a weight of 10,000 N. What is the mass of the car on Earth (g = 10 Nkg^{-1})?

(g) A girl has a weight of 88 N on the moon, where g = 1.6 N/kg. What is her mass?

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17. Why among the three states of matter, gases have the least density?

18. What is the relationship between mass, volume and density?

19. What does the word density mean? And state its SI unit.

20. What activity can you carry out to find the density of irregular solid which is heavier than water and insoluble in it. (Include illustrations).

Illustration

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21. Calculate the relative density of the liquid from the following information.
Mass of empty relative density bottle $\mathbf{M_1}$= 24.5
Bottle with water mass $\mathbf{M_2}$ = 56.2g
Bottle with liquid $\mathbf{M_3}$ = 51.2g

22. If mass of solid is 84.2 g. Initial volume of water in a measuring cylinder is 36 ml. Final volume of water in measuring cylinder is 60 ml. Find the density of substance.

23. In an oil spill in the ocean, the oil rises to the top creating an oil slick on the surface of the ocean. State the reason why.

24. Give the number of significant figures in each measurement.

(a) 4308

(b) 40.05

(c) 470,000

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(d) 4.00

(e) 0.00500

25. Express the final answer to the proper number of significant figures.
a) 101.2 + 18.702

b) 202.88 − 1.013

c) 1.02 + 8.2 + 3.33 + 9.781

26. Calculate the correct number of significant figures for the final solution:
a) 76.4 × 180.4

d) 934.9 ÷ 0.00455

27. A rectangular block of wood has a length of 5.24 cm, a height of 3.645 cm and a width of 0.63 cm. Calculate the volume of the block of wood. Give the answer to the appropriate number of significant figures and decimal places.

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