THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION AND VOCATIONAL TRAINING

PHYSICS SYLLABUS FOR ORDINARY SECONDARY EDUCATION FORM I-IV

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TABLE OF CONTENTS

1.0 Introduction

This Physics syllabus is a revised version which has been prepared to replace that of 1996 syllabus which has been phased out. The revision process focused on change in paradigm from that of content based curriculum to a competence- based curriculum. Moreover, the revision was inevitable due to the fact that the 1996 syllabus did not sufficiently consider the current social, cultural, global, technological, subject biases and cross cutting issues taking place worldwide but particularly in Tanzanian society.

In addition, the revision has also taken into consideration the requirements for the Secondary Education Development Plan (SEDP). This syllabus has been introduced for implementation from January 2007.

2.0 Aims and Objectives of Education in Tanzania

The general aims and objectives of education in Tanzania are to:

a) guide and promote the development and improvement of the personalities of the citizens of Tanzania, their human resources and effective utilization of those resources to bringing about individual and national development;

b) promote the acquisition and appreciation of the culture, customs and traditions of the people of Tanzania;

c) promote the acquisition and appropriate use of literacy, social, scientific, vocational, technological, professional and other forms of knowledge, skills and attitudes for the development and improvement of the condition of man and society;

d) develop and promote self-confidence and an inquiring mind, an understanding and respect for human dignity and human rights and readiness to work hard for self- advancement and national development;

e) promote and expand the scope of acquisition, improvement and upgrading of mental, practical, productive and other skills needed to meet the changing needs of industry and the economy;

f) enable every citizen to understand and uphold the fundamentals of the National Constitution as well as the enshrined human and civic rights, obligations and responsibilities;

g) promote love and respect for work, self and wage employment and improved performance in the production and service sectors;

h) inculcate principles of national ethic and integrity, national and international cooperation, peace and justice through the study, understanding and adherence to provisions of the National Constitution and other international basic charters;

i) enable a rational use, management and conservation of the environment.

3.0 Aims and Objectives of Secondary Education

The aims and objectives of secondary education are to:

a) consolidate and broaden the scope of baseline ideas, knowledge, skills and attitudes acquired and developed at the primary education level;

b) enhance further development and appreciation of national unity, identity and ethic; personal integrity, respect for and readiness to work, human rights, cultural and moral values, customs, traditions and civic responsibilities and obligations;

c) promote the development of competency in linguistic ability and effective use of communication skills in Kiswahili and at least one foreign language;

d) provide opportunities for the acquisition of knowledge, skills, attitudes and understanding in prescribed or selected fields of study;

e) prepare students for tertiary and higher education, vocational, technical and professional training;

f) inculcate a sense and ability for self-study, self-confidence and self-advancement in new frontiers of science and technology, academic and occupational knowledge and skills.

g) prepare the students to join the world of work.

4.0 General Competences

By the end of the four years course, students should have ability to:

a) use Physics knowledge, principles and concepts in daily life;
b) apply scientific methods in solving problems in daily life;
c) apply technological skills in interacting with the environment;
d) manage simple technological appliances.
e) use the language of Physics in communication .

5.0 General Objectives

By the end of the four years course, students should be able to:

a) develop knowledge on concepts, laws, theories and principles of Physics;
b) understand procedures of scientific investigation;
c) acquire technological skills to interact with the environment;
d) develop the language of communication in Physics.

6.0 Structure of the Syllabus

This Physics syllabus has a slightly different structure compared to that of 1997. The following changes were added for improvement:

a) General competences for the whole course.
b) Competences for each class.
c) Suggested areas for assessment.
d) Number of periods per sub-topic.

6.1 Class Level Competences

Competences have been stated for each class/level of Physics course. The class level objectives are derived from the class level competences.

6.2 Class Level Objectives

The general objectives for each class are stated in general terms to indicate the scope of content to be covered within each level.

6.3 Topics

The topics have been derived from the class level competences and objectives. Some topics in the 1997 and 2005 Physics syllabus have been retained. Also some content from cross-cutting issues (CCI), have been integrated. Topics have been rearranged to attain a logical order, starting from the simple to the most difficult ones. Both block and spiral arrangements of topics have been adopted.

6.4 Sub – topics

Topics have been divided into sub-topics. Each sub-topic comprises of a portion of the content of the topic in question. The sub-topics have also been arranged to attain a logical order.

6.5 Specific Objectives

Each sub-topic has one or more specific objectives. These specific objectives are the expected outcomes in classroom instructions. They also reflect the process to attain competences within the cognitive, affective and psychomotor domains.

6.6 Teaching and Learning Strategies

The column of teaching and learning strategies indicates what the students and teacher are expected to do in the process of teaching and learning. Students are encouraged to work in small groups for maximum participatory and cooperative learning. The teacher shall assume the role of a facilitator to promote, guide and help students' teaching and learning activities. The whole teaching and learning process should be participatory and interactive, where the student learn by doing a series of logical activities.

Teaching and learning (T/L) strategies are not exhaustive. The students and teacher may use any other T/L strategies which suit the T/L environment and the available T/L resources to learn/teach a particular topic.

6.7 Teaching and Learning Resources

Teaching of Physics requires a variety of teaching/learning resources in quality and quantity. In case the commercial teaching/learning resources are not available, the teacher should work with students to collect or improvise alternative resources available in their environment.

6.8 Assessment

- *Both formative* (*assessment for learning*) *and summative* (*assessment of learning*) assessment should be done as to check for understanding of the stated objectives in particular topic/subtopic. All in turn will reflect the competences expected to be met at a particular level/class.
- The teacher should use tools of assessment for the teaching and learning process by the end of each lesson. Examples of these tools are: exercise, tests, quiz, examinations, role plays, project work, experiments/ practical and portfolio.

Likewise, in the column of assessment in the scheme of work, a teacher should use these tools of assessment instead of writing the question asked in the said column.

6.9 Number of Periods

The number of periods is an estimated time to be used to teach a given topic/ sub- topic. Each period is 40 minutes. The number of periods have been taken into account the time needed to adequately cover particular sub-topic. Some topics need more time than others depending on the nature and weight of the topic. The teacher is advised to make maximum use of time allocated in classroom instruction. Lost instructional time should always be compensated for.

DECLARATION

Ordinary level secondary education is a four years course which has been designed to prepare students for the advanced level or other tertiary education. A student will be recognized as a Form Four graduate when he/she successfully complete and pass secondary education examinations conducted by National Examination Council of Tanzania.

This document is hereby declared as the Syllabus of Physics for ordinary level secondary education course.

Commissioner for Education
Ministry of Education and Vocational Training

FORM ONE

CLASS LEVEL COMPETENCES

Student should have the ability to: -

1) practice safety rules in daily life;
2) apply laws, principles of Physics in daily life;
3) make appropriate measurements of physical quantities; and
4) use scientific skills to identify nature and properties of matter.

CLASS LEVEL OBJECTIVES

By the end of Form One course, the student should be able to:

1) demonstrate laboratory practice and safety;
2) demonstrate laws and principles of Physics;
3) develop skills for making physical measurements; and
4) recognize behaviour and properties of matter.

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.0 INTRODUCTION TO PHYSICS 1.1 Concept of Physics	The student should be able to: a) explain the concept of Physics	i) The teacher to assist students to brainstorm and discuss the concept of Physics ii) Students to identify various things related to Physics.	i) Manila card ii) Charts with diagram	Is the student able to explain the concept of Physics?	2
	b) establish the relationship between Physics and other subjects	i) The teacher to guide students in their small groups to discuss the relationship between Physics with other subjects. ii) Students to explain the relationship of Physics with other subjects.	i) Science kit ii) Wall charts	Is the student able to establish the relationship between Physics and other subjects?	
	c) state the importance of studying Physics	i) The teacher to guide students in groups to state the importance of studying Physics. ii) Students to discuss and state the importance of studying Physics.	i) Charts of different machines ii) Picture	Is the student able to state the importance of studying Physics?	
1.2 Applications of Physics in Real Life	The student should be able to: a) explain the applications of Physics in real life	i) The teacher to guide students to discuss the applications of Physics in real life. ii) Students in groups to explain the applications of Physics in real life.	Chart with hospital/ industrial machines	Is the student able to explain the applications of Physics in real life?	2

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) apply Physics in daily life	i) The teacher to guide students in groups to describe various applications of Physics in daily life. ii) Students use guidelines to perform activities which demonstrate applications of physics.	i) Apparatus ii) Domestic tools	Is the student able to apply Physics in daily life?	
2.0 INTRODUCTION TO LABORATORY PRACTICE 2.1 Laboratory Rules and Safety	The student should be able to: a) state Physics laboratory rules	i) The teacher to guide students to discuss the laboratory rules. ii) Students to list the Physics laboratory rules.	Chart of Physics laboratory rules.	Is the student able to state Physics laboratory rules?	6
	b) explain the safety measures in Physics laboratory	i) The teacher to guide students in groups to discuss important safety measures for the Physics laboratory. ii) Students to explain important safety measures for Physics laboratory.	i) Wall charts and pictures showing safety measures in Physics laboratory. ii) Foam or Carbon dioxide fire extinguisher	Is the student able to explain safety measures in Physics laboratory?	
	c) use the First Aid Kit to render first aid	i) The teacher to guide students to name each item found in the First Aid Kit. ii) The teacher to demonstrate to students on how to render First Aid Kit. iii) Students to practice in groups on how to render first aid.	First Aid Kit	Is the student able to use each item in a First Aid Kit?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) identify warning signs	i) The teacher to guide students through Think-Pair- Share technique to identify warning signs. ii) Students in groups to differentiate warning signs of the objects/wall chart distributed to them by the teacher.	i) Wall chart of different warning signs. ii) Different objects labelled with warning Signs.	Is the student able to identify warning signs?	
	e) use warning signs in daily life	i) The teacher to demonstrate to students the uses of warning signs in daily life. ii) The teacher to assist students through role play on how to use the warning signs in different context.	i) Label of different objects/ containers. ii) Different objects labeled with warning Signs.	Is the student able to use warning signs in daily life?	
2.2 Basic Principles of Scientific Investigation	The student should be able to: a) explain the concept of scientific investigation.	i) The teacher to organize student in small group to discuss the concept of scientific investigation. a) Students in groups to explain the concept of scientific investigation.	i) Internet ii) Books iii) Apparatus iv) Wall charts	Is the student able to explain the concept of scientific investigation?	3
	b) identify the steps of scientific investigation.	i) By using question and answer technique the teacher to lead students to state the steps of scientific investigation. ii) Students to identify scientific investigation	Wall charts with major steps of scientific investigation	Is the student able to identify the steps of scientific investigation?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) use the scientific investigation methods in solving problems.	i) Teacher to assist students to brainstorm the uses of scientific investigation methods in solving problems. ii) Students to apply scientific investigation methods in solving problems.	i) Physics apparatus ii) Wall charts	Is the student able to use the scientific investigation methods in solving problems?	
3.0 MEASUREMENT 3.1 Concepts of Measurement	The student should be able to: a) explain the concepts of measurement;	i) By using YES/NO cards the teacher to lead students in groups to read case study about the concept of measurement. ii) Students in pairs to explain the concept of measurement.	i) Metre rule ii) Tape measure iii) Beam balance iv) Stop watch v) Clock	Is the student able to explain the concept of measurement?	1
	b) state the importance of measurement in real life.	i) By using Think-Pair-Share technique, the teacher to guide students to state the importance of measurement in real life. ii) Students in groups to apply measurement in various bodies.	i) Solid body ii) Liquid iii) Measurement tools	Is the student able to state the importance of measurement?	
3.2 Fundamental Quantities	The student should be able to: a) define a fundamental quantity;	i) The teacher to assist students to define a fundamental quantity. ii) Students in groups to define fundamental quantity.	i) Metre rule ii) Thermometer iii) Stop watch iv) Beam balance	Is the student able to define a fundamental quantity?	3

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) mention three basic fundamental quantities of measurement;	i) The teacher to lead students to brainstorm the three basic fundamental quantities. ii) Students in groups to mention the three basic fundamental quantities which are mass, length and time.	i) Metre rule ii) Stop watch iii) Beam balance iv) Digital balance	Is the student able to mention the three basic fundamental quantities?	
	c) state the S.I. unit of fundamental quantities; and	i) The teacher to guide students individually to discuss the S.I. units of the basic fundamental quantities. ii) Students to summarize the S.I unit of basic fundamental quantities	i) Books ii) Internet	Is the student able to state S.I units of fundamental quantities?	
	d) use appropriate instruments for measuring fundamental quantities.	i) The teacher to facilitate students to use the appropriate instruments to measure mass, length and time. ii) Students in groups to practice on how to measure mass, length and time.	i) Beam balance ii) Meter rule iii) Stop watch iv) Micrometer screw gauge v) Vernier calliper	Is the student able to use instruments for measuring fundamental quantities?	
3.3 Derived Quantities	The student should be able to: a) explain derived quantities; and	i) The teacher to lead students in plenary to describe the derived quantities. ii) By using Think-Pair-Share technique, students to explain the derived quantities.	i) Spring balance ii) Barometer iii) Beaker	Is the student able to explain derived quantities?	2

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) state the S.I. units of derived quantities.	i) The teacher to guide students in groups to discuss the S.I. units of derived quantities. ii) Students individually to state the S.I. units of derived quantities.	i) Books ii) Internet	Is the student able to state the SI units of derived quantities?	
3.4 Basic Apparatus/ Equipments and their Uses	The student should be able to: a) describe basic apparatus/ equipments used for measurement;	i) By using Thumbs up/Thumbs down technique, the teacher to ask questions relating to basic apparatus/ equipment used for measurement. ii) Students in pairs to describe the basic apparatus/equipment used for measurement.	i) Metre rule ii) Spring balance iii) Beam balance iv) Digital balance v) Measuring cylinder	Is the student able to describe apparatus/ equipment used for measurement?	4
	b) identify sources of errors in measurement.	i) The teacher to guide students to investigate the sources of errors in experiments and how to minimize. ii) Students in groups to discuss the concepts of parallax error, zero error and instrumental error.	i) Stop watch ii) Solid objects iii) Spring balance iv) Metre rule	Is the student able to identify sources of errors in measurement?	
3.5 Density and Relative Density	The student should be able to: a) explain the concept of density of a substance and its S.I. unit;	i) The teacher to guide students to brainstorm the concept of density of a substance and its S.I. unit. ii) Students in groups' to explain the concept of density of a substance and its S.I. unit.	i) Beam balance ii) Metre rule iii) Regular solid e.g. Rectangular wooden blocks of different sizes	Is the student able to explain the concept of density of a substance and its S.I unit?	10

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) determine the density of regular solid , irregular solids and insoluble substance;	i) The teacher to organize students in groups to determine the density of regular solid, irregular solids and insoluble substances. ii) Students to perform experiments to determine the density of regular, irregular and insoluble substances. iii) Students to solve problems of density of regular and irregular solids.	i) Measuring cylinder ii) Calibrated beaker iii) Eureka can iv) Water v) Regular & irregular solid vi) Insoluble substance	Is the student able to determine the density of regular, irregular solids and insoluble substance?	
	c) determine the density of a liquid;	i) The teacher to demonstrate to students on how to determine the density of liquids. ii) Students to practice on how to determine the density of oil and kerosene using density bottle, pipette, burette.	i) Density bottle ii) Kerosine iii) Oil iv) Water	Is the student able to determine the density of liquids?	
	d) define the relative density of a substance;	i) By using Think-Pair-Share techniques the teacher to guide students to describe the concept of the relative density of a substance. ii) Students in groups to solve problems on relative density.	i) Sand, beads ii) Lead shorts	Is the student able to define the relative density of a substance?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) determine the relative density of a substance;	i) The teacher to guide students to perform experiments to determine the relative density of solid and a liquid. ii) Students to perform experiments to determine the relative density of a solid and liquid body.	i) Solid object ii) Liquid iii) Water iv) Beaker v) Density bottle vi) Measuring cylinder	Is the student able to determine the relative density of a substance?	
	f) interpret applications of density and relative density in real life.	i) The teacher to guide students' demonstration on application of density and relative density in real life. ii) Students in groups to interpret the applications of density and relative density in real life.	i) A model of a boat ii) Picture showing bodies floating in water iii) Picture of different elements	Is the student able to interpret applications of density and relative density in real life?	
4.0 FORCE 4.1 Concept of Force	The student should be able to: a) explain the concept of force; and	i) The teacher to use information from YES/ NO cards to assess student's understanding on the concept of force. ii) Students hold up either YES or NO card to respond to the teacher's questions on the concept of force. iii) The teacher to assist students to perform demonstration about the concept of force.	i) Spring balance i) Magnets i) Rubber band i) Block of wood i) Iron filings i) Weights	Is the student able to explain the concept of force?	1

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) state the S.I. unit of force.	i) The teacher to guide students through Think-Pair-Share technique to derive the S.I. unit of force. ii) Students in groups to state the S.I. unit of force.	i) Books ii) Internets	Is the student able to state the SI unit of force?	
4.2 Types of Forces	The student should be able to: a) identify fundamental types of forces; and	i) The teacher to assist students to brainstorm the fundamental forces. ii) Students in groups to identify the fundamental forces.	i) Magnets ii) Spring balance iii) Block of wood iv) Stone, ball	Is the student able to identify the types of forces?	2
	b) describe the properties of each type of the fundamental forces.	i) The teacher to guide students to demonstrate the properties of fundamental forces. ii) Students in groups to describe the properties of fundamental forces.	i) Magnets ii) Spring balance iii) Weights iv) Rubber	Is the student able to describe the properties of fundamental forces?	
4.3 Effects of Forces	The student should be able to: a) identify effects of forces; and	i) By using Think-Pair-Share technique the teacher to assist students to discuss the effects of forces. ii) The teacher to guide students to identify effects of forces. (Stretching, restoring, attraction, repulsion, compression, torsion, frictional and viscosity).	i) Magnets ii) Iron filings iii) Block of wood iv) Stone, ball	Is the student able to identify the effects of forces?	2

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) justify the effects of forces on materials.	i) The teacher to lead students to demonstrate effects of forces on materials. ii) The teacher to assist students through question and answer technique to justify the effects of forces on material.	i) Rubber ii) Weight iii) Springs iv) Spongy	Is the student able to justify the effects of forces on materials?	
5.0 ARCHIMEDES PRINCIPLE AND LAW OF FLOTATION 5.1 Archimedes Principle	The student should be able to: a) explain the concept of up thrust;	i) The teacher to guide students through Think-Pair-Share technique to discuss the concept of upthrust. ii) Students in groups to perform an experiment to determine the upthrust.	i) Spring balance ii) Water iii) Thread iv) Measuring cylinder v) Stones	Is the student able to explain the concept of upthrust?	4
	b) Verify the Archimedes Principle; and	i) The teacher to lead students to carry out experiment to verify Archimedes Principle. ii) Students in groups to verify Archimedes Principle experimentally.	i) Spring balance ii) Water iii) Beaker iv) Eureka Can v) Stone vi) Thread vii) Measuring cylinder	Is the student able to verify the Archimedes Principle?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) Apply the Archimedes Principle to determine relative density.	i) The teacher to facilitate students to state the relationship between apparent loss in weight (upthrust) and real weight. ii) Students in groups to discuss the relationship between apparent loss in weight (upthrust) and real weight. iii) Students in pairs to determine the relative density of a substance by applying the Archimedes' principle.	i) Kerosene ii) Alcohol iii) Density bottle iv) Sand v) Water vi) Beaker	Is the student able to determine the relative density of a substance by applying the Archimedes Principle?	
5.2 Law of Flotation	The student should be able to: a) distinguish floating and sinking of objects;	i) The teacher to assist students through question and answer to distinguish floating and sinking ii) The teacher to demonstrate to students on floating and sinking	i) Wood ii) Coin/stone iii) Fresh egg iv) Pure water v) Salt and stirrer	Is the student able to distinguish floating and sinking objects?	10
	b) explain the conditions for a substance to float in fluids;	i) The teacher to guide students to brainstorm the conditions for a substance to float in fluids. ii) Students to perform experiments to verify the conditions for a substance to float in fluids.	i) Test tube ii) Lead shots iii) Plasticine iv) Water v) Beaker	Is the student able to explain the conditions to substances to float in fluids?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) relate upthrust and weight of floating body;	i) The teacher to guide students through question and answer technique to relate upthrust and weight of floating body. ii) Students in groups to carry out experiment to relate upthrust and weight of a floating body.	i) Spring balance ii) Water iii) Beaker iv) Piece of wood v) Eureka can vi) Measuring cylinder vii) Lead shots/sand	Is the student able to relate upthrust and weight of floating body?	
	d) state the law of flotation;	i) The teacher to guide students to brainstorm the law of flotation. ii) Students in groups to state the law of flotation.	i) Toy ii) Wooden ship iii) Container iv) Water	Is the student able to state the law of flotation?	
	e) apply the law of flotation in everyday life;	i) The teacher to guide students to read case study about various bodies which apply the flotation law. ii) Students in groups to mention bodies which obey the law of flotation. iii) The teacher to guide students to discuss the mode of action of a ship (Plimsoll line) and submarine.	i) Buoyant ii) Ships, Canoes, Boats iii) Balloons iv) Kite	Is the student able to apply the law of flotation in daily life?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	f) describe the mode of action of a hydrometer;	i) The teacher to lead students to demonstrate the mode of action of a hydrometer. ii) Students to practice the mode of action of a hydrometer.	i) Hydrometer ii) Chart of Hydrometer	Is the student able to describe the hydrometer?	
	g) construct a simple hydrometer; and	i) The teacher to supervise students in groups to construct simple hydrometer. ii) Students in their groups to construct a simple hydrometer.	i) Test tube ii) Beaker iii) Lead shots/bearing iv) Salt v) water and Kerosene	Is the student able to construct a simple hydrometer?	
	h) use hydrometer to determine the relative density of different liquids.	i) The teacher to guide student to discuss how a hydrometer is used to measure the relative density of liquids. ii) Students in groups to perform experiment of relative density of liquids by using a hydrometer.	i) Kerosene ii) Water iii) Hydrometer iv) Milk	Is the student able to determine the relative density of different liquids by using a hydrometer?	
6.0 STRUCTURE AND PROPERTIES OF MATTER 6.1 Structure of Matter	The student should be able to: a) explain the concept of matter;	i) The teacher to use concept map technique to discuss with students the concept of matter. ii) Students in pairs to explain the concept of matter.	i) Various objects ii) Liquids iii) gases	Is the student able to explain the concept of matter?	3

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) justify the particulate nature of matter;	i) The teacher to guide students to justify the particulate nature of matter by applying Brownian motion in liquids and in gases. ii) Students to perform experiment to justify the particulate nature of matter by applying Brownian motion in liquids and in gases.	i) Water ii) Coloured substances eg KMnO4 iii) Microscope iv) Pollen gains, v) Marbles vi) Beaker	Is the student able to justify the particulate nature of matter?	
	c) explain the kinetic theory of matter; and	i) The teacher to guide students to brainstorm the kinetic theory of matter. ii) Students demonstrate the movement of particles in smoke and coloured substances using a microscope and a torch.	i) Smoke-cell ii) Light source (torch) iii) Magnifying lens iv) Smoke	Is the student able to explain the Kinetic theory of matter?	
	d) classify three states of matter.	i) The teacher to use YES/NO cards to lead students to classify the three states of matter. ii) Students to in groups to categorize the three states of matter.	i) Solid: Stone, wood ii) Liquid: Water, milk iii) Gas: Oxygen gas, hydrogen gas	Is the student able to classify the three states of matter?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
6.2 Elasticity	The student should be able to: a) explain the concept of elasticity;	i) The teacher to assist students to demonstrate the concept of elasticity. ii) Students in groups to explain the concept of elasticity.	i) Rubber ii) Spiral spring iii) Slotted weights iv) Rule v) Retort stand vi) Mass hanger vii) Pointer	Is the student able to explain the concept of elasticity?	3
	b) justify the relationship between tension and extension of a loaded elastic material; and	i) The teacher to lead students to demonstrate the relationship of tension and extension of loaded elastic material. ii) Students in groups to justify the relationship between tension and extension of loaded material.	i) Spring balance ii) Rule iii) Slotted weights iv) Retort stand v) Mass hanger vi) Pointer vii) Rubber band	Is the student able to justify the relationship between tension and extension of a loaded elastic material?	
	c) identify the applications of elasticity in real life.	i) The teacher to assist students to brainstorm the applications of elasticity in real life. ii) Students in pairs to identify the applications of elasticity in real life.	i) Iron rods ii) Catapult iii) Bow and arrow	Is the student able to identify the applications of elasticity in real life?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
6.3 Adhesion and Cohesion	The student should be able to: a) explain the concept of adhesion and cohesion; and	i) By using thumb up/thumb down technique the teacher to lead students to answer questions related to adhesion and cohesion. ii) Students to explain the concept of adhesion and cohesion.	i) Test tube ii) Sheet of glass iii) Water iv) Measuring cylinder v) Mercury	Is the student able to explain the concept of adhesion and cohesion forces?	3
	b) apply adhesion and cohesion in daily life.	i) The teacher to guide students through question and answer technique to discuss the applications of adhesion and cohesion in daily life. ii) Students to describe the applications of adhesion and cohesion in daily life.	i) Tape ii) Glue iii) Water iv) Needle v) Ink vi) Paper	Is the student able to apply adhesion and cohesion in daily life?	
6.4 Surface Tension	The student should be able to: a) explain the concept of surface tension;	i) The teacher to assist students to demonstrate the concept of surface tension ii) Students to carry out an experiment to verify the concept of surface tension.	i) Mosquito larva ii) Soap iii) Needle iv) Water v) Beaker/trough vi) Thread vii) Pond skaters	Is the student able to explain the concept of surface tension?	3

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) identify the applications of surface tension in daily life;	i) By using question and answer technique the teacher to guide students to identify the applications of surface tension. ii) Students in groups to explain the applications of surface tension.	i) Mosquito larva ii) Soap iii) Needle iv) Water v) Beaker/trough vi) Thread vii) Pond skater	Is the student able to identify the applications of surface tension in daily life?	
6.5 Capillarity	The student should be able to: a) explain the concept of capillarity; and	i) The teacher to guide students to demonstrate the concept of capillarity. ii) Students to carry out an experiment to show capillarity by rise of water in glass tubes with narrow bores of different diameters.	i) Glass tubes with narrow bores of different diameter ii) Kerosene lamp with wick, iii) Blotting paper iv) Towel	Is the student able to explain the concept of capillarity?	3
	b) identify the applications of capillarity in daily life.	i) The teacher to guide the students to brainstorm the applications of capillarity in daily life. ii) Students in groups discuss the applications of capillarity in daily life.	Kerosene lamp with wick,	Is the student able to identify the applications of capillarity in daily life?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
6.6 Osmosis	The student should be able to: a) explain the concept of osmosis; and	i) The teacher to guide students to carry out an experiment for verifying the concept of osmosis. ii) The teacher to guide students to explain the concept of osmosis.	i) Irish potato with a scoop ii) Beaker with water iii) Sugar iv) Table salt	Is the student able to explain the concept of osmosis?	3
	b) identify the applications of osmosis in daily life.	i) The teacher to assist students to brainstorm the applications of osmosis. ii) Students in groups to identify the applications of osmosis in everyday life.	i) Irish potato with a scoop ii) Sugar iii) Table salt	Is the student able to identify the applications of osmosis in daily life?	
7.0 PRESSURE 7.1 Concept of Pressure	The student should be able to: a) explain the concept of pressure; and	i) By using Think-Pair-Share technique the teacher to guide students to explain the concept of pressure. ii) Students to discuss and explain the concept of pressure. iii) Students in groups to lifting a bucket with thin handle and thick handle and explain observation	i) Water ii) Buckets with thin and thick handles iii) Piece of wood iv) Blunt and sharp v) knives	Is the student able to explain the concept of pressure?	2
	b) state S.I. unit of pressure.	i) The teacher to guide students to derive the S.I unit of pressure. ii) Students in groups to discuss the term pressure and state its S.I unit.	Flip chart and marker pen	Is the student able to state the S.I unit of pressure?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
7.2 Pressure due to Solids	The student should be able to: a) explain dependence of pressure on surface of contact; and	i) The teacher to guide students question and answer technique to explain dependence of pressure on surface of contact. i) Students in small groups to cut bars of soap into pieces by using a thin and a thick wire loop and state what they experienced.	i) Bars of soap ii) Thin and thick wire loops	Is the student able to explain the dependence of pressure on surface of contact?	3
	b) identify the applications of pressure due to solids.	i) Students in groups to brainstorm the applications of pressure due to solids. ii) The teacher leads students' discussion on identifying the applications of pressure due to solids.	i) Bars of soap ii) Thin and thick wire loops	Is the student able to identify the applications of pressure due to solids?	
7.3 Pressure in Liquids	The student should be able to: a) describe the characteristics of pressure in liquids;	i) The teacher to guide students to brainstorm the characteristics of pressure in liquids. ii) The teacher to assist students through question and answer technique to describe the characteristics of pressure in liquids.	i) Cans with hole punches at different depths. ii) Cans with holes punched at the same depth iii) Glass vessel with tubes of different diameters iv) Water.	Is the student able to describe the characteristics of pressure in liquids?	8

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) examine the variation of pressure with depth in liquids;	i) Students in small groups to perform activities on the spurting out of water from the holes of a can which are at different depths. ii) The teacher to support students to examine the variation of pressure with depth in liquids and derive the iii) formular $p = h\rho g$.	i) Cans with hole punches at different depths. ii) Water iii) Bucket	Is the student able to examine the variation of pressure with depth in liquids?	
	c) solve problems involving pressure in liquids;	i) Students in groups to solve problems involving pressure in liquids. ii) The teacher to assist students to solve problems involving pressure in liquids.		Is the student able to solve problems involving pressure in liquids?	
	d) explain the principle of a hydraulic press; and	i) Students in small groups to investigate the actions of an applied force to a load by using a model of hydraulic press. ii) The teacher to lead students in deriving the equation $\frac{f}{a} = \frac{F}{A}$ For pressure on the small and large pistons of hydraulic pressure (where f and F are forces at small and large pistons of areas “a” and “A” respectively). iii) The teacher to assist students to explain the principle of a hydraulic press.	i) Models of hydraulic press ii) Hydraulic jack	Is the student able to explain the principle of a hydraulic press?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) measure pressure of a liquid.	i) The teacher to assist students to demonstrate the measurement of pressure of a liquid. ii) Students to demonstrate how to measure pressure of a liquid.	Manometer	Is the student able to measure pressure of a liquid?	
7.4 Atmospheric Pressure	The student should be able to: a) describe the existence of atmospheric pressure;	i) Teacher to assist students to demonstrate the existence of atmospheric pressure. ii) Students in groups to demonstrate and describe the existence of atmospheric pressure.	i) Tumbler with lid, ii) empty can iii) cold water iv) source of heat	Is the student able to describe the existence of atmospheric pressure?	5
	b) identify the applications of atmospheric pressure; and	i) By using Think-Pair-Share technique the teacher to guide students to identify the applications of atmospheric pressure. ii) Students in groups to discuss and identify the applications of atmospheric pressure.	i) Bicycle pump ii) Siphon iii) Syringes iv) Water v) Flushing tanks	Is the student able to identify the applications of atmospheric pressure?	
	c) measure atmospheric pressure.	i) The teacher to lead students to measure the atmospheric pressure. ii) Students in small groups to measure atmospheric pressure by using a barometer.	i) Fortin barometer ii) Aneroid barometer	Is the student able to measure the atmospheric pressure?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
8.0 WORK, ENERGY AND POWER 8.1 Work	The student should be able to: a) explain the concept of work;	i) The teacher to guide students to brainstorm the concept of work as applied to Physics. ii) Students in pairs to explain the concept of work as applied to Physics.	i) Block of wood ii) Thread, Pulley iii) Bench iv) Spring balance, v) Metre rule vi) Stop watch/clock	Is the student able to explain the concept of work?	5
	b) state S.I. unit of work; and	i) The teacher to guide students to derive the S.I unit of work. ii) Students in small groups to state the S.I units of force.	i) Metre rule ii) Beam balance iii) Spring balance iv) Tape measure	Is the student able to state the SI unit of work?	
	c) determine the work done by an applied force.	i) The teacher to lead students to discuss how to determine the work done by an applied force. ii) Students in groups to perform an experiment to determine the work done.	i) Heavy body ii) Tape measure iii) Long metre Ruler	Is the student able to determine the work done by the applied force?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
8.2 Energy	The student should be able to: a) explain the concept of energy;	i) The teacher to assist students through question and answer technique to discuss how to determine the work done by an applied force. ii) Students in groups to explain the concept of energy.		Is the student able to explain the concept of energy?	8
	b) state S.I. unit of energy;	i) The teacher to guide students to derive the S.I. unit of energy. ii) Students in groups to state the S.I unit of energy.		Is the student able to state the S.I unit of energy?	
	c) identify different forms of energy;	i) The teacher to guide students to brainstorm different forms of energy. ii) Students in groups to identify different forms of energy.	i) Helical spring ii) Object iii) Stone iv) Thread v) Bob	Can the student identify different forms of energy?	
	d) distinguish between potential energy and kinetic energy;	i) The teacher to guide students to demonstrate and explain the pushing effect of a compressed spiral spring when released. ii) Students to demonstrate the existence of P.E and K.E using a spiral spring. iii) Students to compute P.E and K.E for a moving body.		Is the student able to distinguish between potential energy and kinetic energy?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) describe the transformation of energy;	i) Through question and answer technique, the teacher to facilitate students to discuss the transformation of energy. ii) Students to describe the transformation of energy.	i) Tube light/ fluorescent tube ii) Motor iii) Telephone iv) Candle v) Electric fan	Is the student able to describe the transformation of energy?	
	f) state the principle of conservation of energy; and	i) The teacher to assist students to brainstorm the principle of conservation of energy. ii) Students to state the principle of conservation of energy.	i) Trolley ii) Objects	Is the student able to state the principle of conservation of energy?	
	g) explain the uses of mechanical energy.	i) The teacher to assist students to discuss the uses of mechanical energy. ii) Students in groups to explain the uses of mechanical energy.		Is the student able to explain the uses of mechanical energy?	
8.3 Power	The student should be able to: a) explain the concept of power;	i) The teacher to use YES/NO cards to ask questions related to the concept of power. ii) Students in pairs to explain concept of power.	i) Heavy body ii) Stop watch/clock iii) Metre rule	Is the student able to explain the concept of power?	4

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) state the S.I. unit of power; and	i) The teacher to guide students to derive the S.I unit of power. ii) Students in pairs to state the S.I. unit of power by relating work done and time.		Is the student able to state the SI unit of power?	
	c) determine the rate of doing work.	i) The teacher assists students to demonstrate how to determine the rate of doing work. ii) The teacher to guide students to determine the rate of raising a heavy body through a given vertical distance.	i) Heavy body ii) Metre rule	Is the student able to determine the rate of doing work?	
9.0 LIGHT 9.1 Sources of Light	The student should be able to: a) explain the concept of light;	i) The teacher to guide students through question and answer technique to discuss the concept of light. ii) Students in groups to explain the concept of light.	i) String ii) Card board iii) Torch iv) Box with a hole	Is the student able to explain the concept of light?	5
	b) identify sources of light; and	i) The teacher to assist students to brainstorm the sources of light. ii) Students in small groups to identify sources of light.	i) Candle ii) Kerosene lamp iii) Sun iv) flame	Is the student able to identify the sources of light?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) distinguish luminous from non-luminous bodies.	i) The teacher guide students through concept map to distinguish between luminous and non-luminous bodies. ii) Students in groups to distinguish luminous from non-luminous bodies.	i) Luminous objects ii) Candle iii) Electric lamp iv) Non-luminous v) objects	Is the student able to distinguish luminous from non-luminous bodies?	
9.2 Propagation and Transmission of Light	The student should be able to: a) explain the concept of rays and beam of light;	i) The teacher to supervise students to perform experiment about light rays and beam of light. ii) Students in group to perform experiment and explain the concept of rays and beam of light.	i) Rays box ii) Candle	Is the student able to explain the concept of rays and beam of light?	5
	b) verify that light rays travels in straight line; and	i) The teacher to lead students to discuss how to verify that light travels in a straight line ii) Students to perform demonstration to verify that light travels in a straight line.	i) String ii) Card board iii) Source of light	Is the student able to verify that light travels in a straight line?	
	c) identify transparent, translucent and opaque materials.	i) The teacher to guide students to brainstorm about transparent, translucent and opaque materials. ii) Students in groups to identify transparent, translucent and opaque materials.	i) Oiled paper ii) Iron sheet iii) Glass iv) Paper stained glass v) Walls	Is the student able to identify transparent, translucent and of opaque materials?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) identify transparent, translucent and opaque materials.	i) The teacher to guide students to brainstorm about transparent, translucent and opaque materials. ii) Students in groups to identify transparent, translucent and opaque materials.	i) Oiled paper ii) Iron sheet iii) Glass iv) Paper stained glass v) Walls	Is the student able to identify transparent, translucent and of opaque materials?	
9.3 Reflection of Light	The student should be able to: a) explain the concept of reflection of light;	i) The teacher to lead students to demonstrate the concept of reflection of light. ii) Students in groups to explain the concept of reflection of light.	i) Rays box ii) Plane mirror iii) Protractor iv) Ruler v) Soft board vi) Optical pins vii) Source of light viii) Plane paper	Is the student able to explain the concept of reflection of light?	6
	b) distinguish regular from irregular reflection of light.	i) The teacher to facilitate the students to distinguish regular and irregular reflection of light. ii) Students in small groups to distinguish between regular and irregular reflection of light.	i) Rays box ii) Plane mirror iii) Protractor, Ruler iv) Soft board, v) Optical pins vi) Source of light vii) Plane paper	Is the student able to distinguish between regular and irregular reflection of light?	

TOPICS/ SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) apply the laws of reflection of light; and	i) The students to carry out an experiment to investigate the laws of reflection of light. ii) From the results of experiment the teacher to assist students to state the laws of reflection of light. iii) The teacher and students to apply the laws of reflection of light to observe the position of the incident ray, the reflected ray and the normal.	i) Rays box ii) Plane mirror iii) Protractor iv) Ruler, Soft board v) Optical pins vi) Source of light vii) Plane paper	Is the student able to apply the laws of reflection of light?	
	d) describe image formed by a plane mirror.	i) Students to perform an experiment to investigate the image formed by a plane mirror. ii) The teacher to assist students to describe the position and size and nature of an image formed by a plane mirror.		Is the student able to describe image formed by a plane mirror?	

FORM TWO

CLASS LEVEL COMPETENCES

Student should have the ability to: -

1) apply electricity and magnetism knowledge in daily life;
2) apply the concepts of turning forces in daily life.
3) apply laws of motion in dealing with moving objects;
4) use simple machine to simplify work; and
5) apply environmental knowledge in interacting with environment.

CLASS LEVEL OBJECTIVES

By the end of Form Two course, the student should be able to: -

1) understand concepts and principles of magnetism and electricity;
2) develop a knowledge of force in equilibrium
3) comprehend the laws of motion;
4) understand principles of simple machine; and
5) understand the concept of temperature.
6) develop knowledge on environmental conservation.

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.0 STATIC ELECTRICITY 1.1 Concept of Static Electricity	The student should be able to: a) explain the concept of static electricity;	i) The teacher to lead students to demonstrate picking up of tiny pieces of paper by plastic pens and other materials rubbed on the hair. ii) Students practicing on picking up of tiny pieces of paper by plastic pens and other materials rubbed on the hair.	i) Plastic pen ii) Ebonite rod iii) Glass rod iv) Fur v) Perspex comb vi) Silk vii) Polythene rod	Is the student able to explain the concept of static electricity?	2
	b) explain the origin of charges;	i) The teacher to organize for read- review-on origin of charges. ii) Students to discuss the origin of charges.	i) Reference books ii) Internet	Is the student able to explain the origin of charges?	
	c) identify the two types of charges;	i) The teacher to organize for discussion on charge movement when two bodies are rubbed against each other. ii) Students to identify two types of charges on a body.	i) Ebonite rod ii) Fur iii) Polythene rod iv) Glass rod	Is the student able to identify two types of charges?	
	d) state the fundamental law of static electricity; and	i) Teacher and students to demonstrate on attraction and repulsion between the suspended rod and other bodies. ii) Teacher to guide students to state the fundamental law of static electricity.	i) Plastic pen ii) Piece of papers iii) Ebonite rod iv) Glass rod v) Thread vi) Retort stand	Is the student able to state the fundamental law of static electricity?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) charge bodies using different methods.	i) The teacher to organize an experiment to show different methods of charging a body. ii) Students to charge bodies by different methods.	i) Piece of papers ii) Plastic pen iii) Glass rod iv) Ebonite rod v) Polythene rod	Is the student able to charge bodies using different methods?	
1.2 Detection of Charges	The student should be able to: a) describe the structure of a gold leaf electroscope;	i) The teacher to guide students to describe the structure and function of gold leaf electroscope. ii) Students to draw and label gold leaf electroscope.	i) Gold leaf electroscope ii) Diagram of leaf electroscope	Is the student able to describe the structure of a leaf electroscope?	2
	b) determine the sign of charges; and	i) The teacher to lead the students to demonstrate the mode of action of electrophorus. ii) Students to charge an electrophorus by induction using charged polythene base. iii) Students to charge a gold leaf electroscope by induction and by contact methods using a positively charged electrophorus.	i) Charged polyethylene base ii) Electrophorus iii) Gold leaf electroscope	Is the student able to determine the sign of charges?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) identify steps of charging and discharging of a gold leaf electroscope.	i) The teacher to demonstrate to students the steps of charging and discharging of a gold leaf electroscope. i) Students to identify steps of charging and discharging of gold leaf electroscope.	i) Conducting wire ii) Gold leaf electroscope	Is the student able to identify steps of charging and discharging of a gold leaf electroscope?	
1.3 Conductors and Insulators	The student should be able to distinguish between a conductor and insulator.	i) The teacher to lead students to distinguish between insulator and conductor. ii) Students to identify conductors and insulators by passing electric current through them. iii) The teacher to lead students to explain the difference between electrical conductivities of conductors and insulators.	i) Copper wire ii) Aluminum rod iii) Glass rod iv) Ebonite rod v) Wood vi) Fur, wax	Is the student able to distinguish between a conductor and insulator?	2
1.4 Capacitors	The student should be able to: a) explain the concept of capacitance;	i) The teacher to lead the students to define the capacitance of a body. ii) Students in groups to give the meaning of capacitance.	i) Source of charge ii) Copper electrodes	Is the student able to explain the concept of capacitance?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain mode of action of a capacitor;	i) The teacher and students to describe mode of action of capacitor. ii) The teacher to lead students to identify different types of capacitors. iii) Students to demonstrate the charging and discharging of a capacitor.	i) Air-filled parallel- plate capacitor ii) Cylindrical capacitor iii) Paper-filled capacitor iv) Variable capacitor v) Battery vi) Resistor voltmeter	Is the student able to explain mode of action of a capacitor?	
	c) describe the construction of an air-filled capacitor; and	i) The teacher to explain the construction of air capacitor. ii) Student to carry out a project to construct an air capacitor.	Air-filled capacitor	Can the student describe the construction of an air-filled capacitor?	
	d) determine equivalence capacitance of a combination of capacitors.	i) The teacher to guide students to determine the equivalent capacitance of two or more capacitors connected in series and in parallel by derivation. ii) Students to derive equivalent capacitance of two or more capacitors connected in series and in parallel.	i) Two or more capacitors ii) Connecting wires iii) Battery	Is the student able to determine equivalence of a combination of capacitors?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.5 Charge Distribution along the Surface of a Conductor	The student should be able to: a) recognize that charge on a conductor reside on it outer surface; and	i) The teacher to organize an experiment to demonstrate charges reside on outer surface of a conductor. ii) Students to verify experimentally that charges resides on outer surface of a conductor.	i) Electrophorus ii) Spherical conductor iii) Pear-shaped conductor iv) Cylindrical conductor v) Hollow metal spheres vi) Gold leaf electroscope vii) Proof plane.	Can the student recognize that charges on a conductor reside on its outer surface?	2
	b) show that charge on a conductor is concentrated on sharply curved surfaces.	i) The teacher to lead students to carry out an experiment to find out the distribution of charges on various shapes of conductors. ii) Students to discuss in groups the results of their observation.	i) Cylindrical conductor ii) Pear-shaped conductor iii) Spherical conductor	Is the student able to show that charges on a conductor is concentrated on sharply curved surfaces?	
1.6 Lightning Conductor	The student should be able to: a) explain the phenomenon of lightning conductor;	i) The teacher to organize jigsaw presentation on the phenomenon of lightning conductor. ii) Students to participate in presentations on phenomenon of lightning conductor.	Chart showing lighting	Is the student able to explain the phenomenon of lightning conductor?	4

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) describe the structure and mode of action of a lightning conductor; and	i) The teacher to use question and answer to highlight the structure and mode of lightning conductor. ii) Students in groups discuss the structure and mode of action of lightning conductor. iii) The teacher to organize excursion for students to observe installed lightning conductor in different buildings.	i) Lighting conductor model ii) Copper rod iii) Copper plate iv) Copper wire v) Sharp pointed conductor	Is the student able to describe the structure and the mode of action of lightning conductor?	
	c) construct a simple lightning conductor.	i) The teacher to assign students through demonstration to construct a lightning conductor. ii) Students in groups to construct and install lightning conductor in a school building.	i) Copper rod ii) Copper plate iii) Copper wire iv) Sharp pointed conductor	Is the student able to construct a simple lightning conductor?	
2.0 CURRENT ELECTRICITY 2.1 Concept of Current Electricity	The student should be able to: a) define current electricity; and	The teacher to lead the students through question and answer technique to define current electricity.	i) Charged capacitor ii) Uncharged capacitor iii) Galvanometer iv) Conducting wire	Is the student able to define current electricity?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) identify different sources of current electricity in everyday life.	i) The teacher to lead students to brainstorm the sources of electricity. ii) Students to discuss in groups the different sources of electricity.	i) Dry cell ii) Accumulator iii) Dynamo iv) Generator v) Solar panel	Is the student able to identify different sources of current electricity in everyday life?	
2.2 Simple Electric Circuits	The student should be able to: a) identify simple circuit components;	i) The teacher to lead students to discuss different circuit components. ii) Students in groups to list down circuit components.	i) Battery ii) Cell iii) Resistor iv) Switch v) Connecting wires	Is the student able to identify basic circuit components?	8
	b) identify simple electric symbols;	i) The teacher to guide students through gallery walk to identify basic electric symbols. ii) Students through information searching to identify basic electric symbols.	Chart showing basic electric symbols	Is the student able to identify simple electric symbols?	
	c) explain the concept of current, voltage and resistance;	i) Teacher to guide students to brainstorm the concept of current, voltage and resistance. ii) Students in groups to explain the concept of current, voltage and resistance.	Chart showing relationship between current, voltage and resistance.	Is the student able to explain the concept of current, voltage and resistance?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) state the S.I units of current, voltage and resistance;	i) The teacher to guide students through question and answer technique to state the S.I units of current, voltage and resistance. ii) Students in groups to discuss and present units of current, voltage and resistance.	Reference books	Is the student able to state the S.I units of current, voltage and resistors?	
	e) connect simple electric circuits;	i) The teacher to give guidelines on how to connect series and parallel circuits. ii) Students to connect circuits in series and in parallel.	i) Bulbs ii) Connecting wires iii) Ammeter iv) Voltmeter v) Battery vi) Switch vii) Resistor	Is the student able to connect simple electric circuits?	
	f) measure electric current and voltage; and	i) The teacher to guide the students through demonstration on how to connect an ammeter and voltmeter. ii) Students in groups to take reading of current and voltage. iii) The teacher to assist students in groups to perform an experiment to verify Ohm's law.	i) Ammeter ii) Voltmeter iii) Circuit components	Is the student able to measure electric current and voltage?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	g) analyse simple electric circuits.	i) The teacher through inquiry deductive to guide students to deduce the equivalent resistance for both parallel and series connections. ii) Students to deduce the equivalent resistance for two resistors connected in series and in parallel. iii) Students to deduce the amount of current flowing in a given circuit and voltage drop across a resistor.	Circuit diagrams	Is the student able to analyse simple electric circuits?	
3.0 MAGNETISM 3.1 Concept of Magnetism	The student should be able to: a) explain the origin of magnetism;	i) The teacher to assign students library or internet search to find out the origin of magnetism. ii) Students by using gallery walk to discuss the origin of magnetism.	i) Reference books ii) Internet	Is the student able to explain the origin of magnetism?	5
	b) identify magnetic and non-magnetic materials/ substances;	i) The teacher to display different types of magnetic and non-magnetic materials and organize for their testing on magnetic behaviour. ii) Students to identify magnetic and non-magnetic materials.	i) Magnets ii) Iron rod iii) Cobalt plate iv) Nickel rod v) Steel rod vi) Copper rod vii) Piece of wood viii) Glass block	Is the student able to identify magnetic and non-magnetic materials/ substances?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) state the properties of magnets;	i) The teacher to lead students to investigate the properties of a magnet. ii) The students to suspend a bar magnet to find its direction at rest. iii) The students to investigate the action of bringing another bar magnet close to the suspended one. iv) The students to state the properties of magnet.	i) String ii) Support iii) Iron filings iv) Various types of magnets	Is the student able to state the properties of magnets?	
	d) identify types of magnets; and	i) The teacher to display various types of magnets and assign students to name them. ii) Students in groups to identify the types of magnets.	i) U-shaped magnet ii) Bar magnet iii) Cylindrical magnet iv) Horse-shoe magnet v) Filed magnet	Is the student able to identify types of magnets?	
	e) identify applications of magnets	i) The teacher to assign students through peer groups to investigate situations where magnets are used. ii) Students in groups to identify the applications of magnets.	i) Flip chart ii) Marker pens	Is the student able to identify different applications of magnets?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.2 Magnetization and Demagnetization	The student should be able to: a) explain the concept of magnetization and demagnetization;	i) The teacher to assist students through library search to explain the concept of magnetization and demagnetization. ii) Students to present their findings.	i) Strong bar magnet ii) Iron nails iii) Reference books iv) Internet v) Flip chart vi) Marker pens	Is the student able to explain the concept of magnetization and demagnetization?	5
	b) demonstrate magnetization and demagnetization	i) The teacher to lead students to demonstrate on how magnetize magnetic materials. ii) Students to demonstrate magnetization. iii) The teacher to facilitate students to demonstrate demagnetization of a magnetic material.	i) Strong bar magnet ii) Nails iii) hammer with wooden handle iv) A.C. source v) A battery vi) Steel bar	Is the student able to demonstrate magnetization and demagnetization?	
	c) design methods of storing magnets.	i) The teacher to stimulate discussions on how a magnet can lose its magnetization. ii) Students to identify ways by which magnets lose its magnetism. iii) Teacher to guide students through question and answer technique to mention methods of storing magnets.	i) Bar magnet ii) Short steel bars	Is the student able to design methods of storing magnets?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.3 Magnetic Fields of a magnet	The student should be able to: a) explain the concept of magnetic fields of a magnet;	i) The teacher to lead students to brainstorm the concept of magnetic fields. ii) Students in small groups to explain the concept of magnetic field.	i) 2 bar magnets ii) a wooden clamp iii) a nail	Is the student able to explain the concept of magnetic fields of a magnet?	4
	b) illustrate the magnetic lines of force around a magnet using iron fillings or compass needle; and	i) The teacher to lead students to perform an experiment to study the pattern of the lines of force around a bar magnet. ii) Students to plot the pattern of the lines of force around a bar magnet. iii) The teacher by using question and answer technique, to lead students to identify the properties of magnetic lines of force. iv) Students to demonstrate that the lines of force are closer together where the field is stronger.	i) Bar magnet ii) Iron filings iii) Plain paper iv) Pencil v) Compass needle	Is the student able to illustrate the magnetic lines of force around a magnet using iron fillings or compass needle?	
	c) explain the method of magnetic shielding.	i) The teacher to lead students to demonstrate how to shield a magnetic material from magnetic lines of force. ii) Students to demonstrate practically how to shield a magnetic material from magnetic lines of force.	i) Soft iron ring ii) Magnet	Is the student able to explain the method of magnetic shielding?	

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		iii) Students to discuss the importance of shielding equipment from being affected by magnetic fields.			
3.4 Earth's Magnetic Field	The student should be able to: a) explain the phenomenon of earth's magnetism;	i) The teacher to lead students through question and answer technique to explain the existence of the earth's magnetic field. ii) Students in groups to explain the phenomenon of earth's magnetism.	i) Compass needle ii) Thread iii) Retort stand iv) World globe	Is the student able to explain the phenomenon of earth's magnetism?	5
	b) determine direction of earth's magnetic field;	i) Students to suspend a bar magnet freely to determine the direction of the earth's magnetic field. ii) The teacher to lead students to determine the direction of the earth's magnetic field.	i) Bar magnet ii) Thread iii) Retort stand	Is the student able to determine direction of earth's magnetic field?	
	c) locate the earth's magnetic lines of force about a bar magnet.	i) The teacher to assist students to locate the earth's magnetic lines of force about a bar magnet. ii) Students to use iron fillings to locate the earth's magnetic lines of force about a bar magnet.	i) Bar magnet ii) Iron fillings	Is the student able to locate the earth's magnetic lines of force about a bar magnet?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) measure the angles of inclination (dip) and angles of declination; and	i) The teacher to guide the students to investigate on how determine the angle of declination and inclination. ii) Students to measure the angle made by the settled needle with respect to the horizontal plane.	i) Compass needle ii) Protractor iii) Support	Is the student able to measure angles of inclination (dip) and angles of declination?	
	e) state the applications of earth's magnetic field.	i) Teacher to guide the students in stating the applications of earth's magnetic field ii) Students to state the application of earth's magnetic field	i) compass needle ii) protector iii) magnetic needle	Is the student able to state the applications of earth's magnetic field?	
4.0 FORCES IN EQUILIBRIUM 4.1 Moment of a Force	The student should be able to: a) explain the effects of turning forces;	i) The teacher to guide students to perform activities of pulling or pushing objects and observe the resulting motion of the object. ii) Students to apply simultaneously parallel and opposite forces on different objects.	i) Hinged window ii) Hinged door iii) Suspended piece of wood	Is the student able to explain the effects of turning forces?	4
	b) determine the moment of force;	i) The teacher to lead the students to brainstorm on how determine the moment of force. ii) Students to determine moment of force.	i) Metre rule ii) String iii) Two different masses,	Is the student able to determine the moment of force?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) state the principle of moments; and	i) Teacher to guide students to conduct experiment to verify the principle of moments. ii) Students to state the principle of moments.	i) Variety of masses ii) knife edge iii) Wooden bar	Is the student able to state the principle of moments?	
	d) apply the principle of moments in daily life.	i) The teacher to lead the students through investigation to apply the principle of moments. ii) Students to explain how the principle of moments is applied in different situations.	i) See-saw ii) Beam balance iii) Door	Is the student able to apply the principle of moments in daily life?	
4.2 Center of Gravity	The student should be able to: a) explain centre of gravity;	i) The teacher to organize students 'gallery- walk presentations on the meaning of centre of gravity. ii) Students to explain the meaning of centre of gravity.	i) Uniform rule ii) knife edge	Is the student able to explain the centre of gravity?	4
	b) determine center of gravity of regular shaped body; and	i) The teacher to guide students to brainstorm on how to determine the centre of gravity of a regular shaped body. ii) Students to determine the centre of gravity of a regular shaped body.	i) A piece of uniform triangular cardboard. ii) A plumbline iii) Rule.	Is the student able to determine centre of a gravity of regular shaped body?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine centre of gravity of irregular shaped body.	i) The teacher to assign students through question and answer technique to determine the centre of gravity of an irregular shaped body. ii) Students to determine the centre of gravity of an irregular body.	i) A piece of irregular shaped ii) Plumb line iii) Supporting nail	Is the student able to determine the centre of gravity of an irregular shaped body?	
4.3 Types of equilibrium	The student should be able to: a) explain the conditions for equilibrium;	i) The teacher to lead students to brainstorm on the conditions for equilibrium. ii) Students to explain the conditions for equilibrium.	i) uniform bar ii) knife edge iii) Bottle iv) Ball	Is the student able to explain the conditions for equilibrium?	4
	b) explain stable, unstable and neutral equilibrium; and	i) The teacher to lead students' gallery walk presentation on describing the three states of equilibrium. ii) Students to explain stable, unstable and neutral equilibrium.	i) Solid wooden cone ii) Table iii) Bottle iv) Ball	Is the student able to explain stable, unstable and neutral equilibrium?	
	c) apply conditions of stable, unstable and neutral equilibrium in daily life.	i) The teacher to lead students' discussion on how to apply conditions of stable, unstable and neutral equilibrium in daily life. ii) Students in groups to identify applications of the three states of stability in daily life.	i) Solid objectives of various shapes ii) Model of a bus or lorry.	Is the student able to apply conditions of stable, unstable and neutral equilibrium in daily life?	

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5.0 SIMPLE MACHINES 5.1 Concept of Simple Machines	The student should be able to: a) explain the concept of a simple machine;	i) The teacher to lead students to do a library search to deduce the meaning of simple machine. ii) Students to explain the concept of a simple machine.	i) Bolts and nuts ii) Spanners iii) Single fixed pulley iv) Different masses v) Stone vi) Rope vii) Bottle and bottle opener	Is the student able to explain the concept of a simple machine?	4
	b) explain the terms applied in simple machines; and	The teacher to facilitate the students in groups to deduce the meaning of the terms Load, Effort, Mechanical Advantage, Velocity Ratio and Efficiency as applied to simple machines.	i) Bottle openers ii) Crow bars iii) Wheel barrow iv) Heavy stone v) Capped bottles	Is the student able to explain the terms used in simple machines?	
	c) identify the different kinds of simple machines.	i) The teacher to stimulate students to brainstorm the different kinds of simple machines. ii) Students in groups to identify different types of simple machines.	i) Lever ii) Pulley iii) Incline plane iv) Screw-jack/car jack v) Bicycle wheel-and-axle vi) Model of hydraulic press.	Is the student able to identify different kinds of simple machines?	

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5.2 Levers	The student should be able to: a) identify the three classes of levers;	i) The teacher to facilitate students through question and answer technique to identify three classes of levers. ii) Students in groups to identify the three classes of levers.	i) Scissors ii) Claw-hammer iii) Coal-tong iv) Nut crackers v) Wheel barrow vi) Crow bar vii) Wire cutters viii) Fishing rod ix) Biceps muscle and forearm.	Is the student able to identify the three classes of levers?	5
	b) determine the mechanical advantage, velocity ratio and efficiency of lever; and	i) The teacher to guide students to brainstorm on how to determine the mechanical advantage, velocity ratio and efficiency of a lever. ii) Students to perform experiments to determine the mechanical advantage, velocity ratio and efficiency of a lever.	i) Beam balance ii) Crow bar iii) Wheel barrow iv) Scissors v) See-saw	Is the student able to determine the mechanical, advantage velocity ratio and efficiency of a lever?	

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	c) use levers in daily life.	i) The teacher to organize students in groups to discuss applications of levers in daily life. ii) Students to describe the uses of levers in daily life.	i) Beam balance ii) Crow bar iii) Wheel barrow iv) Scissors v) Claw-hammer vi) Coal-tong	Is the student able to use levers in daily life?	
5.3 Pulleys	The student should be able to: a) identify different pulley systems; and	i) The teacher to guide students' gallery walk presentation on different pulley systems. ii) Students in groups to identify the different pulley systems.	i) Single fixed pulley ii) Single movable pulley iii) Movable pulleys iv) Block-and-tackle pulleys v) Ropes.	Is the student able to identify different pulley systems?	3
	b) determine, mechanical advantage, velocity ratio and efficiency of pulley system;	i) The teacher to guide students through question and answer technique to determine the mechanical advantage, velocity ratio and efficiency of a pulley system. ii) Student to calculate the mechanical advantage, velocity ratio and efficiency of the pulley system.	i) Single fixed pulley system ii) Rope iii) Two masses iv) Metre rule	Is the student able to determine mechanical advantage, velocity ratio and efficiency of pulley system?	

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	c) use pulleys in daily life.	i) The teacher to organize for a field visit by students to observe applications of pulley systems in daily life. ii) Students to discuss result of the field visit and identify other possible applications of pulley systems.	i) Flip charts ii) Marker pens	Is the student able to use pulleys in daily life?	
5.4 Inclined Plane	The student should be able to: a) state the concept of inclined plane	i) The teacher to lead students to discuss why it is easier to push a heavy load up an inclined plane than to lift it vertically. ii) Students through think-pair-share to state the concept of inclined plane.	i) Heavy load ii) Inclined plane	Is the student able to state the concept of inclined plane?	3
	b) determine mechanical advantage, velocity ratio and efficiency of inclined plane.	i) Teacher to facilitate students to brainstorm on how to determine mechanical advantage, velocity ratio and efficiency of inclined plane. ii) Students to determine the mechanical advantage, velocity ratio and efficiency of the inclined plane.	i) Ladder ii) load iii) support	Is the student able to determine mechanical advantage, velocity ratio and efficiency of inclined plane?	
	c) apply inclined plane in daily life	i) The teacher to lead students to discuss the applications of inclined plane in daily life. ii) Students in groups to discuss situations where the inclined plane is applied in everyday life.	i) Ladder ii) Building tops	Is the student able to apply inclined plane in daily life?	

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5.5 Screw Jack	The student should be able to: a) describe the structure of a screw jack.	i) The teacher to organize students to study the main features of the screw jack and the way it functions. ii) Students to practice lifting a heavy load using a screw jack.	i) Screw Jack ii) Car jack iii) Heavy load	Is the student able to describe the structure of a screw jack?	3
	b) determine the mechanical advantage, velocity ratio and efficiency of a screw jack; and	i) The teacher to facilitate students through question and answer technique to determine mechanical advantage, velocity ratio and efficiency of screw jack. ii) Students to determine the mechanical advantage, velocity ratio and efficiency of a screw jack.	i) Screw jack ii) Car jack	Is the student able to determine the mechanical advantage, velocity ratio and efficiency of screw jack?	
	c) use the screw jack in daily life.	i) The teacher to guide students to discuss the applications of the screw jack in daily life. ii) Students to discuss in groups the various situations where the screw jack in used.	i) Car ii) Screw jack	Is the student able to use a screw jack in daily life?	
5.6 Wheel and Axle	The student should be able to: a) describe the structure of a wheel and axle;	i) The teacher to display a wheel-and- axle of a bicycle ii) Students in groups to discuss the main features of a wheel-and-axle and how it functions.	i) Wheel-and-axle. ii) Bicycle	Is the student able to describe the structure of a wheel and axle?	3

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	b) determine the mechanical advantage, velocity ratio and efficiency of a wheel and axle.	i) The teacher to guide students through question and answer technique to determine the mechanical advantage, velocity ratio and efficiency of a wheel -and -axle system. ii) Students to determine the mechanical advantage, velocity ratio and efficiency of the wheel-and- axle.	i) Heavy load ii) wheel and axle iii) rope	Is the student able to determine mechanical advantage, velocity ratio and efficiency of a wheel and axle?	
	c) use the wheel and axle in daily life.	i) The teacher to organize for group discussion on the application of wheel-and-axle in daily life. ii) Students in groups to site examples of devices which utilize the principle of the wheel-and-axle.	i) Windlass machine ii) Bicycle	Is the student able to use the wheel and axle in daily life?	
5.7 Hydraulic Press	The student should be able to: a) describe the structure of hydraulic press;	i) The teacher to display a model of the hydraulic press and guide students to discuss its working mechanism. ii) Students in groups to describe structure of a hydraulic press.	Model of hydraulic press	Is the student able to describe the structure of hydraulic press?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) determine mechanical advantage, velocity ratio and efficiency of a hydraulic press; and	i) The teacher to guide students through question and answer technique to determine the mechanical advantage, velocity ratio and efficiency of a hydraulic press. ii) Students to determine the mechanical advantage, velocity ratio and efficiency of the hydraulic press.	i) Two strings of different sizes. ii) Model of hydraulic press iii) Two pistons of different size	Is the student able to determine mechanical advantage, velocity ratio and efficiency of a hydraulic press?	
	c) use the hydraulic press in daily life.	i) The teacher to lead students to discuss on applications of the hydraulic press. ii) Students to discuss in groups the applications of hydraulic press. iii) Students in groups to identify other examples of devices utilizing the principle of the hydraulic press.	i) car breaks ii) bicycle pump iii) syringe	Is the student able to use the hydraulic press in daily life?	
6.0 MOTION IN STRAIGHT LINE 6.1 Distance and Displacement	The student should be able to: a) distinguish between distance and displacement;	i) The teacher to guide students to brainstorm on how to distinguish distance from displacement. i) Students to give the difference between distance and displacement.	i) Tape measure ii) Markers iii) Rule iv) Manila cards	Is the student able to distinguish between distance and displacement?	1

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	b) state the S.I units of distance and displacement.	i) The teacher to display various flash cards with S.I units, one of which has the correct SI unit of distance and displacement. ii) Students to identify S.I units of distance and displacement. iii) Students to state the S.I units of distance and displacement.	i) Tape measure ii) Flash cards iii) manila cards iv) marker pens	Is the student able to state S.I units of distance and displacement?	
6.2 Speed and Velocity	The student should be able to: a) distinguish between speed and velocity;	i) The teacher to assist students to demonstrate how speed differs from velocity. ii) Students to distinguish between speed and velocity.	i) Clock ii) Stop watch iii) Measuring tape iv) Rule	Is the student able to distinguish between speed and velocity?	3
	b) state the SI unit of speed and velocity; and	i) The teacher to organize think pair share on deriving the S.I unit of speed and velocity ii) Students to state the S.I unit of speed and velocity.	i) Moving object ii) speed sensor camera iii) Speedometer	Is the student able to state the S.I units of speed and velocity?	
	c) determine average velocity of a body.	i) The teacher to stimulate students to brainstorm how to determine average velocity of a body. ii) Students to determine average velocity of the body.	i) Speedometers ii) Timer iii) Measuring tape	Is the student able to determine the average velocity of the body?	

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6.3 Acceleration	The student should be able to: a) interpret velocity time-graph;	i) The teacher to display different velocity time graphs for students to interpret. ii) Through reciprocal-teaching and question and answer techniques students to interpret velocity-time graphs for increasing velocity, constant velocity and decreasing velocity.	i) Velocity – time graphs ii) graph paper iii) pencil iv) rubber	Is the student able to interpret velocity-time graph?	2
	b) determine the acceleration of a body; and	i) The teacher to guide students to discuss the velocity-time graphs. ii) Students to determine the rate of change in velocity with time. iii) Students to determine acceleration of a body.	i) Velocity –time graphs ii) graph paper iii) pencil iv) rubber	Is the student able to determine the acceleration of a body?	
	c) explain the concept of retardation.	i) The teacher to lead students through question and answer technique to describe the concept of retardation. ii) Students to explain the concept of retardation.	i) Trolleys ii) Ticker-tape-timer iii) Velocity-time graph iv) stop watch	Is the student able to explain concept of retardation?	

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6.4 Equations of Uniformly Accelerated Motion	The student should be able to: a) derive equations of uniformly accelerated motion; and	i) The teacher to facilitate students to apply deductive thinking to derive equations of uniformly accelerated motion. ii) Students to derive equations of uniformly accelerated motion.	i) Manila sheets ii) Charts of equations of motion.	Is the student able to derive equations of uniformly accelerated motion?	3
	b) apply equations of accelerated motion in daily life.	i) The teacher to motivate students to solve problems related to equations of uniformly accelerated motion. ii) Students to solve problems related to equations of uniformly accelerated motion.	Bank of kinematics questions	Is the student able to apply equations of motion in daily life?	
6.5 Motion under Gravity	The student should be able to: a) explain the concept of gravitational force;	i) The teacher to encourage students to Think-Pair-Share their ideas on a body thrown vertically upwards and a falling body. ii) Students in groups to explain the concept of gravitational force.	i) Stones ii) Balls	Is the student able to explain the concept of gravitational force?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) determine acceleration due to gravity; and	i) The teacher to organize the students to determine acceleration due to gravity experimentally. ii) Students to perform an experiment on determination of accelerations due to gravity by simple pendulum.	i) Pendulum bob ii) Inextensible string iii) Metre rules iv) Stop watch v) Retort stand vi) Small string vii) holding corks viii) Graph papers.	Is the student able to determine acceleration due to gravity?	
	c) explain the applications of gravitational force.	i) The teacher to direct the students to search and discuss applications of gravitational force. ii) Students to present their findings on applications of gravitational force.	i) Flip charts ii) Marker pens iii) Stones iv) feathers	Is the student able to explain the applications of gravitational force?	
7.0 NEWTON'S LAWS OF MOTION 7.1 1st Law of Motion.	The student should be able to: a) explain the concept of inertia;	i) The teacher to stimulate discussion on the behaviour of an object/body when there is a sudden change of its state of motion. ii) Students to brainstorm the tendency of applied force on a body when is at rest or in motion.	i) Heavy load ii) Bottle iii) Cards iv) Coin	Is the student able to explain the concept of inertia?	3

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	b) state Newton's first law of motion; and	i) The teacher to lead students through question and answer technique to describe Newton's first law of motion. ii) Students to state Newton's law of motion.	i) Heavy load ii) Bottle iii) Cards iv) Coin	Is the student able to state Newton's first law of motion?	
	c) verify Newton's first law of motion.	i) The teacher to facilitate for demonstrations of Newton's first law of motion on an object at rest. ii) Students to perform an experiment to verify Newton's first law of motion.	i) Coin ii) Card iii) Tumbler iv) Table cloth on a table v) Tea cups	Is the student able to verify Newton's first law of motion?	
7.2 2nd Law of Motion	The student should be able to: a) explain concept of linear momentum;	i) The teacher to facilitate for students to investigate the relationship between the velocity and mass of a body moving in a straight line. ii) Students to explain the concept of linear momentum.	i) Trolley ii) Various masses	Is the student able to explain the concept of linear momentum?	6
	b) state the S.I unit of linear momentum;	i) The teacher to encourage students to deduce the S.I units of linear momentum from the product of mass and velocity. ii) Students to deduce and state the SI unit of linear momentum	i) Trolley ii) Various masses	Is the student able to state the S.I unit of linear momentum?	

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	c) determine linear momentum;	i) The teacher to guide students to determine experimentally the linear momentum of a body ii) Students to perform an experiment to measure the velocity of a trolley loaded with a known mass. iii) Students to compute the product of total mass of trolley and its velocity to give the linear momentum.	i) Trolley ii) Various masses iii) Timer iv) Metre rule	Is the student able to determine linear momentum?	
	d) state Newton's second law of motion and	i) The teacher to organize for an experiment for students to investigate the rate of change of momentum when the applied force is varied. ii) Students to conduct the experiment to determine the rate of change of linear momentum of a body. iii) Student to deduce the statement of Newton's second law of motion from above experiment.	i) Trolleys ii) Ticker-tape-timer iii) Various masses iv) String	Is the student able to state Newton's second law of motion?	

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	e) verify Newton's second law of motion.	i) The teacher to facilitate students to carry out an experiment to verify Newton's second law of motion. ii) Student to perform an experiment to investigate the relationship between applied force and acceleration for a constant mass. iii) Student to investigate experimentally the relationship between mass and acceleration for a constant applied force.	i) Dynamic trolley ii) Ticker-tape-timer iii) Hard floor/surface iv) Muddy surface v) Spongy surface	Is the student able to verify Newton's second law of motion?	
7.3 Conservation of Linear Momentum	The student should be able to: a) distinguish between elastic and inelastic collisions;	i) The teacher to organize students to investigate types of collision. ii) Students to conduct experiment to distinguish between elastic and inelastic collision.	i) Tennis ball ii) Spongy surface iii) Hard floor/surface iv) Muddy surface	Is the student able to distinguish between elastic and inelastic collisions?	3
	b) state the principle of conservation of linear momentum;	i) The teacher to lead students to deduce the relationship between linear momentum before and after a collision. ii) Students to determine experimentally the linear momentum of two bodies moving towards each other before and after collision.	i) Two trolley ii) Various masses	Is the student able to state the principle of conservation of linear momentum?	

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		iii) Students to compare the total momentum before and after collision, and hence deduce the principle of conservation of linear momentum.			
	c) apply the principle of conservation of linear momentum in solving problems.	i) The teacher to organize students for group discussion to identify applications of the principle of conservation of linear momentum. ii) Students in the groups to discuss applications of the principle of conservation of linear momentum. iii) The students to apply the principle of conservation of linear momentum in solving problems.	i) punch bags ii) car air bags iii) pool table iv) kicking a ball	Is the student able to apply the principle of conservation of linear momentum in solving problems?	
7.4 Third Law of Motion	The student should be able to: a) distinguish between action and reaction forces;	i) The teacher to lead students through question and answer technique to give the meaning of action and reaction forces. ii) Students to identify the action forces and reaction forces in bodies.	i) Ball ii) Bicycle pump iii) Hammer iv) Nails	Is the student able to distinguish between action and reaction forces?	2

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	b) state Newton's third law of motion; and	i) The teacher to organize the students to demonstrate that action and reaction forces are related. ii) Students to deduce that for each action force there is equal and opposite reaction force. iii) Students to state Newton's third law of motion.	i) Stiff spiral spring ii) Block of wood or book iii) A table iv) Retort stand	Is the student able to state Newton's third law of motion?	
	c) apply Newton's third law of motion.	i) The teacher to organize students in groups to discuss application of Newton's third law of motion. ii) Students to discuss in groups the applications of Newton's third law in daily life. iii) Students to solve problems involving Newton's third laws of motion.	i) Stand-on weighing scale ii) Car sit belt	Is the student able to apply Newton's third law of motion?	
8.0 TEMPERATURE 8.1 Concept of Temperature	The student should be able to: a) define the term temperature; and	i) The teacher to lead the students through Think-Pair-Share to define the term temperature. ii) Students to define the term temperature.	i) Water ii) Ice iii) Heater iv) Deep freezer	Is the student able to define the term temperature?	1

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	b) state the S.I units of temperature.	i) The teacher to lead students through question and answer technique to derive the S.I unit of temperature. ii) Students to state the S.I unit of temperature	i) Reference books ii) Internet	Is the student able to state the S.I units of temperature?	
8.2 Measurement of Temperature	The student should be able to: a) identify measurable physical properties that change with temperature;	i) The teacher to assist students to search information from different sources on measurable physical properties that change with temperature. ii) Students to work in groups to collect information on physical properties that change with temperature.	i) Water ii) Heater iii) Balloon iv) Mercury in glass thermometer	Is the student able to identify measurable physical properties that change with temperature?	4
	b) define the fundamental interval of a thermometer;	i) The teacher by using question and answer to guide students to define fundamental interval of a thermometer. ii) Students to define the upper and lower fixed points of a thermometer.	i) Alcoholic thermometer ii) Melting ice iii) Boiling water iv) Mercury thermometer	Is the student able to define the fundamental interval of a thermometer?	

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	c) describe the mode of action of liquid-in-glass thermometer; and	i) The teacher to organize the students to investigate how alcohol in-glass thermometer works. ii) Students to record the reading of thermometer in ice and hot water iii) Students to describe the mode of action of liquid-in-glass thermometer.	i) Hot water ii) Ice iii) Alcoholic thermometer iv) One-sided closed narrow glass cylinder v) Mercury thermometer	Is the student able to describe the mode of action of liquid-in-glass thermometer?	
	d) measure accurately the temperature of a body.	i) The teacher to lead the students to measure temperature of different bodies. ii) Students in groups to record the temperature of different bodies.	i) Thermometer ii) Hot water iii) Cold water	Is the student able to measure accurately the temperature of a body?	
9.0 SUSTAINABLE ENERGY SOURCES 9.1 Water Energy	The student should be able to: a) explain the generation of electricity from water;	i) The teacher to lead students to discuss the generation of electricity from water. ii) Students to explain energy changes in the generation of hydroelectricity.	i) Diagram of a hydroelectric power plant ii) Hydroelectric power plant	Is the student able to explain the generation of electricity from water?	3
	b) explain the importance of water energy; and	i) The teacher to lead students to discuss the importance of water energy ii) Students to explain common applications of water energy.	i) Reference books ii) diagram of hydroelectric power plant	Is the student able to explain the importance of water energy?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) construct a model of hydroelectric power plant.	i) Student to draw a diagram of a model of a hydroelectric power plant. ii) The teacher to guide students to construct a model of a hydroelectric power plant.	i) Manila sheet ii) Razor blades iii) Motor iv) Straws v) Bottle caps vi) Connecting wire vii) Shaft viii) Source of flowing water ix) Galvanometer x) Retort stand	Is the student able to construct a model of hydroelectric-power plant?	
9.2 Solar Energy	The student should be able to: a) explain the sun as a source of energy;	i) The teacher to lead students to discuss the sun as the primary source of energy on earth. ii) Students to list down the main applications of solar energy.	i) Convex Lenses ii) Solar panel iii) Dry Paper	Is the student able to explain the sun as a source of energy?	3

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain the conversion of solar energy to electric energy; and	i) The teacher to guide students to brainstorm how solar energy can be converted to electricity. ii) Students to discuss in group the solar conversion mechanisms to electricity. iii) Students to draw a circuit diagram showing the conversion of solar energy into electricity by a solar cell.	i) Solar panel ii) Photovoltaic (solar) iii) Cell	Is the student able to explain the conversion of solar energy to electricity?	
	c) construct a model of solar panel.	i) The teacher to guide students to discuss the construction of a model of a solar panel. ii) Student to design and construct a model of a solar panel.	i) Solar cells ii) Model of a solar panel	Is the student able to construct a model of solar panel?	
9.3 Wind Energy	The student should be able to: a) explain wind as a source of energy;	i) The teacher to stimulate the students to investigate that wind is a source of energy. ii) Students to show that wind can cause objects to move.	i) Wind ii) Feathers iii) Cotton wool iv) Papers	Is the student able to explain wind as a source of energy?	3
	b) construct a model of a wind mill; and	i) The teacher to organize for educational visit to a place where wind mill is used. ii) Students to construct a model of a wind mill.	i) Wind mill ii) Wood iii) Nails iv) Glue v) Box	Is the student able to construct a model of a wind mill?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) apply wind mill in daily life.	i) The teacher to lead the students to discuss the applications of wind mill in daily life. ii) Students in groups to discuss the applications of the wind mill.	i) Flip chart ii) Marker pens iii) Masking tape	Is the student able to apply wind mill in daily life?	
9.4 Sea Wave Energy	The student should be able to: a) explain sea wave as a source of energy; and	i) The teacher to lead students in groups to discuss the sea-waves as a source of energy. ii) Students in their groups to discuss the energy from the sea-waves.	i) Diagram of sea wave energy plant ii) website iii) Sea wave charts	Is the student able to explain sea wave as a source of energy?	2
	b) explain the conversion of sea wave energy to electric energy.	i) The teacher to guide students to discuss on how sea wave energy can be converted to electricity. ii) Students to brainstorm on how sea wave energy can be converted to electricity. iii) Students in groups to construct a model system of converting sea- wave energy into electricity.	i) Cardboard ii) Scissors iii) Nails iv) Tape/glue v) Website vi) Knife vii) Water	Is the student able to explain conversion of sea wave energy to electric energy?	
9.5 Geothermal Energy	The student should be able to: a) explain geothermal as a source of energy;	i) The teacher to guide students in group to brainstorm the geothermal as the source of energy. ii) Students in their groups to discuss the source of geothermal energy.	i) Diagram of geothermal plant ii) Website	Is the student able to explain geothermal as a source of energy?	2

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain the conversion of geothermal energy to electric energy.	i) The teacher to lead students to discuss how geothermal energy can be converted into electricity. ii) Students in groups to discuss the ways of converting geothermal energy to electricity. iii) The students to draw a diagram of a steam turbine and explain how it works to convert steam energy to electricity.	i) Manila paper ii) Scissors iii) Glue iv) Marker pen v) website	Is the student able to explain the conversion of geothermal energy to electric energy?	

FORM THREE

CLASS LEVEL COMPETENCES

Students should have the ability to: -

1) apply knowledge of vectors in daily life;
2) apply rules of friction in daily life;
3) use the knowledge of light in the constructions of optical instruments;
4) apply the concepts and laws of heat in daily life; and
5) manage the use of current electricity in daily life.

CLASS LEVEL OBJECTIVES

By the end of Form Three course, the student should be able to: -

1) develop knowledge of vectors
2) realize the importance of friction in daily life;
3) understand principles of construction of optical instruments;
4) understand the mechanism of heat transfer and its measurement;
5) promote knowledge on thermal expansion of matter; and
6) understand effects and uses of current electricity.

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.0 APPLICATIONS OF VECTORS 1.1 Scalar and Vector Quantities	The student should be able to: a) distinguish between scalar and vector quantities;	i) The teacher to guide students through question and answer technique to classify the physical quantities into scalars and vectors. ii) Students to distinguish physical quantities from scalars and vectors.	Chart showing physical quantities (scalars and vectors).	Is the student able to distinguish between scalar and vector quantities?	3
	b) add vectors using graphical method; and	i) The teacher to demonstrate to the students on how to add vectors by graphical method. ii) Students to add displacement, velocities and forces by graphical method.	i) Graph papers ii) Ruler iii) Mathematical set	Is the student able to add vectors using graphical method?	
	c) state the triangle and parallelogram laws of forces.	i) The teacher to lead student to brainstorm the triangle and parallelogram laws of forces. ii) Students to find the resultant and direction of a vector by using triangle and parallelogram laws.	i) Graph papers ii) Rulers iii) Mathematics set	Is the student able to state the triangle and parallelogram laws of forces?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.2 Relative Motion	The student should be able to: a) explain the concept of relative motion;	i) The teacher to lead students to explain the concept of relative motion. ii) Students to discuss the relative velocity of two objects moving in the same direction and in the opposite directions.	i) Graph papers ii) Ruler iii) Mathematical set iv) Moving cars or train	Is the student able to explain the concept of relative motion?	3
	b) calculate the relative velocity of two bodies; and	i) The teacher to guide students to find the relative velocities of two bodies by drawing or calculation. ii) Students to find the relative velocities of two bodies by drawing or calculation.	i) Graph papers ii) Rulers iii) Mathematical set iv) Moving objects	Is the student able to calculate relative velocities of two bodies?	
	c) apply the concept of relative motion in daily life.	i) The teacher to lead students to brainstorm the applications of relative motion in daily life. ii) Students to discuss the applications of relative motion in daily life.	i) Moving boat ii) Moving objects iii) Air plane	Is the student able to apply relative motion in daily life?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.3 Resolution of Vectors	The student should be able to: a) explain the concept of components of a vector;	i) The teacher to guide students to do a gallery walks presentation on the concept of resolution of vectors. ii) Students to explain the concept of components of a vector	i) Graph papers ii) Ruler iii) Mathematical set iv) Protractor	Is the student able to explain the concept of components of a vector?	3
	b) resolve a vector into two perpendicular components; and	i) The teacher to lead students to do inquiry deductive to resolve a vector into two mutually perpendicular directions. ii) Students to resolve a vector into two mutual perpendicular directions.	i) Graph paper ii) Mathematical set	Is the student able to resolve a vector into two perpendicular components?	
	c) apply resolution of vectors in solving problems.	i) The teacher to guide students to do a library search on where resolution of vectors used in solving problems. ii) Students to solve problems of forces and velocities by resolution of vectors.	i) Moving boat ii) Air plane	Is the student able to apply resolution of vectors in solving problems?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
2.0 FRICTION 2.1 Concept of Friction	The student should be able to: a) explain the concept of friction;	i) The teacher to assist students through question and answer technique to explain the concept of friction. ii) Students to discuss in groups the concept of friction	i) inclined plane ii) Lubricants iii) Wooden block	Is the student able to explain the concept of friction?	2
	b) realize the advantages and disadvantages of friction in daily life; and	i) The teacher to guide students to discuss the advantages and disadvantages of friction in daily life. ii) Students to mention the advantages and disadvantages of friction such as braking, wear and tear in locomotion.	i) Screws ii) Brake systems of a bicycle and car iii) Motor tyre with treads. iv) blocks v) rollers vi) used shoes vii) oil	Is the student able to realize the advantages and disadvantages of friction in daily life?	
	c) describe methods of reducing friction.	i) The teacher to guide students in groups to discuss the ways of reducing friction. ii) Students in groups to describe the method of reducing friction by using rollers, ball bearings and lubricants.	i) Roller ii) Grease iii) Bearings	Is the student able to describe methods of reducing friction?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
2.2 Types of Friction	The student should be able to: a) identify types of friction; and	i) The teacher to lead students to discuss the types of forces. ii) Students to identify types of friction in groups.	i) Block of wood ii) Rough surface iii) Spring balance.	Is the student able to identify types of friction?	2
	b) determine limiting friction.	i) The teacher to guide students through question and answer technique to describe the limiting friction. ii) Students to determine the limiting friction by using a block of wood.	i) Incline plane ii) Horizontal plane iii) Blocs of wood	Is the student able to determine limiting friction?	
2.3 Laws of Friction	The student should be able to: a) state laws of friction;	i) The teacher to lead students to do a gallery walks presentation about the laws of friction. ii) Students to state the laws of friction.	i) Block of wood ii) Spring balance iii) Weights iv) Rough surface	Is the student able to determine the coefficient of static friction?	4
	b) determine the coefficient of friction; and	i) The teacher to guide students to discuss the coefficient of static and dynamic friction. ii) Students in groups should carry out an experiment to determine the coefficient of static friction.	i) Spring balance ii) Trolley iii) Weights	Is the student able to state the laws of friction?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) apply laws of friction in solving problems.	i) The teacher to guide students through question and answers technique to solve problems on friction. ii) Students to solve problems by applying the laws of friction.	i) bank of questions ii) past papers	Is the student able to solve problems by applying the laws of friction?	
3.0 LIGHT 3.1 Reflection of Light from Curved Mirrors	The student should be able to: a) distinguish between concave and convex mirrors;	i) The teacher to display concave and convex mirrors to students. ii) Students to describe the features of concave and convex mirrors and distinguish them.	i) Convex mirror ii) Concave mirror iii) Spoon	Is the student able to distinguish between concave and convex mirrors?	6
	b) explain the terms principle axis, pole, principle focus, radius of curvature and focal length as applied to curved mirrors;	i) The teacher to guide students to brainstorm on how to describe the principle axis, pole, principle focus, focal length and radius of curvature as applied to mirrors. ii) Students to explain the principle axis, pole, principle focus, focal length and radius of curvature as applied to curved mirrors.	i) Curved mirrors ii) Graph paper iii) Mathematical set iv) Pin	Is the student ale to define the terms applied to curved mirrors?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) Locate the images formed by a curved mirror;	i) The teacher to guide students to demonstrate on how to locate images formed by a curved mirror. ii) Students to define nature, position and size of image formed by curved mirror.	i) Graph paper ii) Curved mirror iii) Plane paper iv) object	Is the student able to locate the images formed by curved mirror?	
	d) Determine practically the focal length of a concave mirror;	i) The teacher to lead students to carry out an experiment to determine the focal length of a concave mirror by non-parallax method or illuminated object. ii) Students to carry out an experiment to determine the focal length of a concave mirror by non-parallax method or illuminated object. iii) Students to deduce the correct focal length of the concave mirror.	i) Screen ii) Optical pins iii) Ray box iv) Torch. v) Dark room vi) Curved mirror	Is the student able to determine the focal length of a concave mirror practically?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) determine the position, size and nature of the image formed by a curved mirror and.	i) The teacher to guide students through question and answer technique to compute the position of images formed by using the mirror formulae. ii) Students to compute the position of the image formed by using the mirror formulae $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$	i) graph paper ii) Pencil iii) rule	Is the student able to determine the position, size and nature of the image formed by curved mirrors?	
	f) use convex and concave mirrors in daily life.	i) The teacher to demonstrate the uses of the convex and concave mirrors. ii) Students to identify different uses of convex and concave mirrors in daily life.	i) Shaving mirrors ii) Driving mirrors	Is the student able to use convex and concave mirrors in daily life?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.2 Refraction of Light	The student should be able to: a) explain the concept of refraction of light.	i) The teacher to lead students to brainstorm the concept of refraction of light. ii) Students to use a ray box and rectangular glass block to show refraction of light at a boundary.	i) Drawing board ii) Rectangular glass block iii) optical pin iv) Rule v) ray box	Is the student able to explain the concept of refraction of light?	6
	b) measure the angle of incidence and angle of refraction;	i) The teacher to demonstrate the angles of incidence and refraction. ii) Students to measure the angle of incidence and angle of refraction.	i) Optical pins ii) Protractor iii) Drawing board iv) Rule v) Glass block	Is the student able to measure the angle of incidence and angle of refraction?	
	c) state the laws of refraction;	i) The teacher to lead students to discuss the laws of refraction. ii) Students to state the laws of refraction.	i) Charts ii) Cards	Is the student able to state the laws of refraction?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) determine the refractive index of a material;	i) The teacher to guide students to perform an experiment to determine the refractive index of a material ii) Students to carry out an experiment to determine the refractive index of a material.	i) Plane mirror ii) Optical pins iii) Retort stand iv) Water v) Beaker vi) Object	Is the student able to determine the refractive index of a material?	
	e) explain the concept of critical angle and total internal reflection of light; and	i) The teacher to lead student to brainstorm the definition of a critical angle and total internal reflection of light. ii) Students to define the critical angle and total internal reflection of light. iii) The teacher to lead students to determine critical angle and total internal reflection of light using a semi-circular glass block.	i) Semi-circular glass block ii) Plane paper iii) Optical pin iv) Protractor v) Soft board vi) Drawing pins	Is the student able to explain the concept of critical angle and total internal reflection of light?	
	f) explain the occurrence of mirage.	i) The teacher to organize a study field trip. ii) Students to discuss the conditions and occurrence of mirage.	i) Chart with a mirage ii) Tamar road	Is the student able to explain the occurrence of mirage?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.3 Refraction of Light by Rectangular Prism	The student should be able to: a) explain the concept of refraction of light by a rectangular prism; and	i) The teacher to lead students to investigate and discuss the concept of refraction of light by rectangular prism. ii) Students to explain in groups the concept of refraction of light by rectangular prism.	Diagrams of light passing through rectangular prism.	Is the student able to explain the refraction of light by a rectangular prism?	2
	b) trace the passage of light through a rectangular prism.	i) The teacher to guide students to trace the passage of light through a rectangular prism. ii) Students in groups to trace the passage of light through a rectangular prism.	i) Glass block ii) Rule iii) Pencil iv) White papers v) Drawing pins vi) Soft Board	Is the student able to trace the passage of light through a rectangular prism?	
3.4 Refraction of Light by Triangular Prism	The student should be able to: a) trace the passage of light through a triangular prism;	i) The teacher to assist students through question and answers technique to trace the passage of light through triangular prism. ii) Students to demonstrate the passage of light through triangular prism.	i) Triangular prisms ii) Drawing pins iii) Papers iv) Pencil v) Rule vi) Soft Board	Is the student able to trace the passage of light through a triangular prism?	2

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) demonstrate the dispersion of white light;	i) The teacher to lead students to demonstrate dispersion of white light using triangular prism. ii) Students to discuss in groups the deviation of colours of the white light.	i) Source of white light ii) Triangular prism iii) Screen	Is the student able to demonstrate dispersion of white light?	
	c) determine the angles of deviation and minimum deviation; and	i) The teacher to guide students to demonstrate about angles of deviation and minimum deviation. ii) Students to determine the angles of deviation and minimum deviation.	i) Protector ii) Glass prism iii) Plane paper iv) Mathematical set v) Rule vi) Soft board vii) Drawing pins	Is the student able to determine angles of deviation and minimum deviation?	
	d) construct a simple prism binocular.	i) The teacher to guide students to construct a prism binocular as a project work. ii) Students in groups to construct a prism binocular as a project work.	i) Prism binocular ii) 2 Glass prism of 45^{o} iii) Hard box iv) Scissors v) Mirror vi) Glue	Is the student able to construct simple prism binocular?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.5 Colours of light	The student should be able to: a) explain the components of white light;	i) The teacher to facilitate discussion on the components of white light seven colours; (ROYGBIV). ii) Students to form rainbow by spraying water in the same direction with the sun rays. iii) Students to discuss in groups the formation of primary and secondary rainbow.	i) Chart showing colours of white light ii) Water spray iii) Water iv) Sun rays v) Hand lens	Is the student able to explain the components of white light?	6
	b) recombine colours of white light;	i) The teacher to lead students to recombine colours of white light using two triangular glass prism the second prism inverted. ii) Students to recombine colours of white light by rotating Newton's colour disc.	i) Prisms ii) Newton's colour disc iii) Water sprayer iv) Water v) Sub rays vi) Hand lens	Is the student able to recombine the colours of white light?	
	c) explain the appearances of coloured object under white light;	i) The teacher to guide student to demonstrate the appearance of coloured objects in white light. ii) Students to demonstrate the appearance of coloured objects in white light. iii) Students to investigate the appearance of a white object under coloured light.	i) Coloured objects ii) Coloured filters iii) White light iv) Coloured light v) White objects.	Is the student able to explain the appearances of coloured objects under white lights?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	f) identify primary, secondary and complementary colours of light; and	i) The teacher to guide student do inquiry deductive to direct the red, blue and green beams which are primary colours to a white screen. ii) Students in group to observe and identify secondary and complementary colours.	i) Blue filter ii) Red filter iii) Green filter iv) White screen	Is the student able to identify, primary, secondary and complementary colours of light?	
	e) distinguish between additive and subtractive combination of colours.	i) The teacher to guide students to discuss about additive and subtractive colour mixing. ii) Students to perform different experiments or additive and subtractive combinations of colours. iii) Students in groups to distinguish additive from subtractive combination of colours.	i) Paints of different colours ii) Filters	Is the student able to distinguish between additive and subtractive combination of colour?	
3.6 Refraction of Light by Lenses	The student should be able to: a) distinguish between convex and concave lenses;	i) The teacher to display different types of concave and convex lenses to students. ii) Students to describe features of convex and concave lenses.	i) Concave lenses ii) Convex lenses	Is the student able to distinguish between concave and convex lenses?	8

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain the terms focal length, principle focus, principle axis and optical centre as applied to lenses;	i) The teacher to use questions and answers technique to show students the focal length, principal focus, principal axis and optical centre as applied to lenses. ii) Students to identify the positions of the focal length, principle focus, principle axis and optical centre.	Chart showing lenses	Is the student able to explain the terms focal length, principle focus, principle axis and optical centre used in lenses?	
	c) determine practically the focal length of a lens;	i) The teacher to lead students to carry out an experiment to determine the focal length of a convex lens. ii) Students to carry out experiments to determine the focal length of a convex lens.	i) Lens holder ii) Optical pins iii) Plane mirrors iv) Metre rule v) Optical bench vi) Dark room	Is the student able to determine practically the focal length of a lens?	
	d) locate the image formed by a lens.	i) The teacher to guide student to discuss ray rules as applied to lenses. ii) Students to draw ray diagrams using the ray rules to locate and interpret the image formed by a lens.	i) Graph paper ii) Chart showing ray diagrams iii) Mathematical set	Is the student able to locate image formed by a lens?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) determine the position, size and nature of the image formed by lens;	i) The teacher to guide students brainstorm on how to determine the position, size and nature of the image formed by lens by using the formula $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ ii) Students in groups to discuss the nature and size of images formed by the object at different positions along the principal axis.	i) Charts ii) website	Is the student able to determine the position size and nature of the image formed by a lens?	
	f) determine the magnification of a lens; and	i) The teacher to lead students to place a small object between the optical centre and the principal focus of a convex lens and observe the image. ii) Students to determine the magnification of a lens.	i) Convex lenses ii) Small objects	Is the student able to determine magnification of a lens?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	g) determine the relationship between focal length (f) object distance (u) and image distance (v) as applied to lenses.	i) The teacher to guide students through question and answers technique to apply equation of lens ii) Students to apply the lens formulae to solve problems $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$	Charts showing the lens formulae	Is the student able to determine the relationship between f, v and u.?	
4.0 OPTICAL INSTRUMENTS 4.1 Simple Microscope	The student should be able to: a) describe the structure of the simple microscope;	i) The teacher to guide students to do a gallery walk presentation on how describe the structure of the simple microscope. ii) Students to discuss in groups the structure of the simple microscope.	Simple microscope	Is the student able to describe the structure of a simple microscope?	4
	b) describe the mode of action of a simple microscope;	i) The teacher to lead students through question and answer technique to describe the mode of action of a simple microscope. ii) Students to discuss in groups the mode of action of a simple microscope. iii) Student to determine the magnification of a simple microscope.	Simple microscope	Is the student able to determine the magnification of a simple microscope?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) construct a simple microscope.	i) The teacher to guide students to construct a simple microscope. ii) Students in groups to construct a simple microscope.	i) Convex lens. ii) Box iii) Scissors iv) Glue	Is the student able to construct a simple microscope?	
4.2 Compound Micr**oscope**	The student should be able to: a) describe the structure of a compound microscope;	i) The teacher to display a compound microscope and an optical drawing of a compound microscope. ii) Students to discuss the structure of a compound microscope.	i) Compound microscope. ii) Chart showing components of microscope.	Is the student able to describe the structure of a compound microscope?	4
	b) describe the mode of action of a compound microscope;	i) The teacher to guide students to discuss the mode of action of a compound microscope. ii) Students to discuss the mode of action of a compound microscope. iii) Students to draw a ray diagram showing the formation of an image of an object by the compound microscope.	i) Graph paper ii) Ruler iii) Mathematical set	Is the student able to describe the mode of action of a compound microscope?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine the magnification of a compound microscope;	i) The teacher to lead students through question and answer technique to determine the magnification of a compound microscope. ii) Students to determine the magnification of a compound microscope. iii) Students to draw ray diagrams of compound microscope and determine its magnification.	i) Graph paper ii) Rule iii) Mathematics set	Is the student able to determine the magnification of a compound microscope?	
	d) mention uses of a compound microscope; and	i) The teacher to assist students to brainstorm the common uses of a compound microscope. ii) Student to mention the uses of compound microscope in everyday life.	i) Charts ii) website	Is the student able to mention the uses of a compound microscope?	
	e) construct a simple compound microscope.	i) The teacher to facilitate students in constructing a simple compound microscope. ii) Students to constructing a simple compound microscope.	i) Lenses ii) Screen iii) Object iv) Box	Is the student able to construct compound microscope?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
4.3 Astronomical Telescope	The student should be able to: a) describe the structure of an astronomical telescope;	i) The teacher to display an astronomical telescope and an optical drawing of an astronomical telescope. ii) Students to draw a diagram of the optical arrangement of astronomical telescope and label its parts. iii) Students in groups to discuss the structure of an astronomical telescope.	i) Astronomical telescope ii) Diagram of astronomical telescope	Is the student able to describe the structure of the astronomical telescope?	4
	b) describe the mode of action of an astronomical telescope;	i) The teacher to guide students brainstorm on how to describe the mode of action of astronomical telescope. ii) Students in groups to discuss the mode of action of astronomical telescope.	i) Astronomical telescope i) Diagram of astronomical telescope	Is the student able to describe the mode of action of the astronomical telescope?	
	c) determine the magnification of an astronomical telescope;	i) The teacher to lead students through question and answer technique to determine the magnification of an astronomical telescope. ii) Students in groups to determine the magnification of an astronomical telescope.	i) Astronomical telescope ii) Diagram of astronomical telescope	Is the student able to determine the magnification of an astronomical telescope?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) mention uses of an astronomical telescope;	i) Students to discuss the uses of an astronomical telescope in everyday life. ii) The teacher to highlight the common applications of astronomical telescope	i) Weather station ii) Tourist site	Is the student able to mention the uses of an astronomical telescope?	
	e) construct a simple astronomical telescope.	i) The teacher to guide student to construct a simple astronomical telescope. ii) Student to construct simple astronomical telescope	i) Convex lenses ii) Screen iii) Objects iv) Box	Is the student able to construct a simple astronomical telescope?	
4.4 Projection Lantern	The student should be able to: a) describe the structure of the projection lantern;	i) The teacher to lead student to investigate the structure of a projection lantern. ii) Students to discuss the structure of projection lantern.	i) Projection lantern ii) Diagram of projection lantern.	Is the student able to describe the structure of a projection lantern?	4
	b) describe the mode of action of a projection lantern;	i) The teacher to lead students to discuss the mode of action of a projection lantern. ii) Students to discuss the mode of action of a projection lantern. iii) Students to discuss the formation of an image of an object by a projection lantern.	Projection lantern	Is the student able to discuss the mode of action of a projection lantern?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine the magnification of a projection lantern;	i) The teacher to assist students to do a library search on how to draw a ray diagram showing the formation of an image of an object by a projection lantern. ii) Students to determine the magnification of a projection lantern.	Projection lantern	Is the student able to determine the magnification of the projection lantern?	
	d) mention uses of a projection lantern; and	i) Students to do a library search on the uses of a projection lantern in daily life. ii) The teacher to guide students to highlight the uses of a projection lantern.	Diagram of projection lantern	Is the student able to mention the uses of a projection lantern?	
	e) construct a simple projection lantern.	i) The teacher to guide student to construct a simple projection lantern. ii) Students to construct a simple projection lantern.	i) Lens ii) Slide iii) Object iv) Screen	Is the student able to construct a simple projection lantern?	

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4.5 The Lens Camera	The student should be able to: a) describe the structure of the lens camera;	i) The teacher to display a lens camera and an optical drawing of a lens camera. ii) Students to discuss in groups the structure of a lens camera.	i) A lens camera ii) Optical drawing of a lens camera.	Is the student able to describe the essential parts of a lens camera?	4
	b) describe the mode of action of the lens camera;	i) The teacher to lead students to through question and answer technique to discuss the mode of action of the lens camera. ii) Students to describe the mode of action of a lens camera.	i) Camera ii) Diagram of camera	Is the student able to describe the mode of action of a lens camera?	
	c) determine the magnification of the lens camera; and	i) The teacher to lead students to discuss the formation of an image of an object by a lens camera ii) Students to discuss the formation of an image of object by a lens camera. iii) Students to determine the magnification of the lens camera.	A lens camera	Is the student able to determine the magnification of a lens camera?	
	d) construct a simple lens camera.	i) The teacher to lead students to construct a simple lens camera. ii) Students to construct a simple lens camera.	i) lens ii) Box iii) Scissor iv) Glue	Is the student able to construct a simple lens camera?	

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4.6 The Human Eye	The student should be able to: a) describe the structure of the human eye;	i) The teacher to guide students to do an investigation about the structure of the human eye. ii) Students to draw the diagram showing the structure of the human eye.	Model of human eye	Is the student able to describe the structure of the human eye?	4
	b) explain accommodation power of the human eye;	i) The teacher to facilitate students to brainstorm the way the eye adjusts itself to form a clear image on the retina for objects at varying distances. ii) Students to discuss how the eye adjusts itself to form a clear image on the retina.	Model of human eye	Is the student able to explain accommodation power of the human eye?	
	c) identify the defects of the human eye;	i) The teacher to guide students to discuss the types of defects of the human eye that is short and long sight. ii) Students to discuss the defects of the human eye: short and long sight.	Model of human eye	Is the student able to differentiate between short and long sight?	
	d) describe the correction of the defects of the human eye; and	i) The teacher to guide students through question and answer technique to highlight the correction of short and long sight. ii) Student to discuss on how to correct short and long sights.	Spectacles	Is the student able to describe the correction of the defects of the eye?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) compare the human eye and the lens camera.	i) The teacher to lead students to discuss the similarities of the lens camera and the human eye. ii) Students to discuss the similarities of the lens camera and the human eye.	Optical diagram of a lens camera	Is the student able to compare the lens camera and the human eye?	
5.0 THERMAL EXPANSION 5.1 Thermal Energy	The student should be able to: a) explain the concept of heat;	i) The teacher to lead students to brainstorm on the concept of heat. ii) Students to explain the concept of heat.	i) Firewood ii) Charcoal, iii) Kerosene iv) Electricity, v) Petrol, Diesel vi) Solar energy vii) Gas	Is the student able to explain the concept of heat?	2
	b) state the sources of thermal energy in everyday life and;	i) The teacher to lead students to do a library search about the sources of thermal energy in everyday life. ii) Students to discuss the sources of thermal energy in everyday life.	i) Electricity, gas ii) petrol, diesel iii) solar energy	Is the student able to state the sources of thermal energy in everyday life?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) distinguish between heat and temperature.	i) The teacher to guide students to do a role plays to differentiate heat from temperature. ii) Students in groups to distinguish between heat and temperature.	i) Hot water ii) Cold water iii) Heater	Is the student able to distinguish between temperature and heat?	
5.2 Thermal Expansion of Solids	The student should be able to: a) demonstrate expansion of solids;	i) The teacher to lead students to demonstrate the expansion of solids using ball and ring experiment. ii) Students to perform various activities to demonstrate expansion and contraction of solids.	i) Ball and ring ii) Bar breaker iii) Source of heat iv) Brass and Iron strips v) Nails vi) Shoe tacks	Is the student able to demonstrate the concept of expansion of solids?	4
	b) explain expansion of solids in terms of kinetic theory of matter;	i) The teacher to guide students to discuss in groups the expansions and contraction of solids in terms of the kinetic theory of matter. ii) Students to explain the terms expansion and contraction in terms of the kinetic theory of matter.	Marble model	Is the student able to explain expansion of solids in terms of the kinetic theory of matter?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) identify expansivity of different solids; and	i) The teacher to lead students to through question and answer technique to develop the formulae of the linear expansion of solids. ii) The teacher to highlight the concept of coefficient of linear expiation. iii) Students to carry out experiments to compare expansion of different solids.	i) Chart showing a formulae of linear expansion ii) Chart of metals of various expansively.	Is the student able to determine the expansivity of solids?	
	d) explain the applications of expansion of solids in daily life.	i) The teacher to assist students to do a gallery walks presentation about common applications of expansion of solids. ii) Students to explain the applications of expansion of solids in daily life.	i) Diagram showing sag of field wires ii) Diagram showing bridges iii) Diagram of rails	Is the student able to explain the application of solid expansion?	
5.3 Thermal Expansion of Liquids	The student should be able to: a) explain the apparent expansion of liquids;	i) The teacher to guide students to brainstorm the apparent expansion of a liquid. ii) Students to show volume expansion of liquids experimentally. iii) Students in groups to define the expression for volume expansivity of liquids.	i) Water ii) Water basin iii) Test tube with capillary tube iv) Souce of heat v) Cooling oil vi) Kerosene vii) Motor oil	Is the student able to explain the apparent expansion of liquids?	4

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) demonstrate the effect of heat on liquids;	i) The teacher to lead students to demonstrate the effect of heat on the density of liquids. ii) Students to determine the variation of density with temperature for different liquids.	i) Water ii) Motor oil iii) Hydrometer iv) Beaker v) Heater vi) Thermometer	Is the student able to demonstrate the effect of heat on liquids?	
	c) verify the anomalous expansion of water; and	i) The teacher to lead students to carry out an experiment to investigate the variation of density with temperature when water is warmed from -5^{o}C to 10^{o}C. ii) Students to draw a graph of density against temperature and read from the graph at which the density is a maximum. iii) Students to discuss in groups the concept of anomalous expansion of water and its importance.	i) Thermometer ii) Ice iii) Graph paper iv) Pencil v) Rule	Is the student able to determine practically the anomalous expansion of water?	
	d) explain the applications of expansion of liquids in everyday life.	i) The teacher to guide students to brainstorm on the applications of the expansion of liquids.	Pictures and photo graphs of marine life.	Is the student able to explain applications of liquid expansion?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
		ii) The teacher through question and answer technique to highlight the most common applications of expansion of liquids.			
5.4 Thermal Expansion of Gases	The student should be able to: a) explain the concept of thermal expansion of gases;	i) The teacher to lead student to do a library search on the concept of thermal expansion of gases. ii) Students to explain the concept of thermal expansion of gases.	Web site and reference books	Is the student able to explain the thermal expansion in gases?	10
	b) investigate the relationship between volume and temperature of a fixed mass of air at constant pressure;	i) The teacher to lead students to carry out an experiment to determine the relationship between the volume and the temperature of a fixed mass of air at constant pressure. ii) Students to perform the above experiment and draw a graph of volume against temperature (^oC) of a fixed mass of air at constant pressure. iii) Students to deduce the statement of Charles's Law.	i) Source of heat ii) capillary tube with mercury pellet iii) Ruler, iv) tripod stand v) Water vi) Thermometer vii) graph paper viii) Tall jar. ix) Sulphuric acid	Is the student able to verify Charles's law?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) investigate the relationship between pressure and volume of a fixed mass of air at constant temperature;	i) The teacher to lead students to carry out an experiment to find out the relationship between volume and pressure of a fixed mass of gas at constant temperature. ii) Students to perform the above experiment and draw a graph of volume against pressure at constant temperature. iii) Students to deduce the statement of Boyle's law.	i) Glass tube ii) Bicycle pump iii) Bourdon gauge iv) Oil v) graph paper vi) Rule	Is the student able to verify Boyle's law?	
	d) investigate the relationship between pressure and temperature of a fixed mass of gas at constant volume;	i) The teacher to lead students to carry out an experiment to find out the relationship between pressure and temperature of a fixed mass of gas at constant volume. ii) Students to plot a graph of pressure versus temperature of iii) a fixed mass of a gas at constant volume. iv) Students to deduce the statement of the pressure law.	i) Beaker ii) Thermometer iii) Retort stand iv) Rubber tube v) U - shaped capillary tube. vi) Round bottomed flask vii) Stirrer viii) Source of heat ix) Rubber stopper x) Water xi) Oil	Is the student able to verify the pressure law?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) identify the general gas equation from the gas laws;	i) The teacher to guide students through question and answer technique to derive the general gas equation constant ii) Students to derive the general gas equation. iii) Students to apply the general gas equation to solve problems.	Chart showing STP values of gases	Is the student able to derive the general gas equation? To what extent can the student explain STP?	
6.0 TRANSFER OF THERMAL ENERGY 6.1 Conduction	The student should be able to: a) explain the concept of conduction of heat;	i) Students to brainstorm the concept of heat conduction of heat. ii) The teacher guide students through question and answer technique to discuss the concept of conduction of heat. iii) Students to demonstrate conduction in solids by standing in a row and pass an object from the first to the last changing their positions.	i) Brass rod ii) Bunsen burner	Is the student able to explain the concept of conduction of heat?	4
	b) identify good and bad conductors of heat;	i) The teacher to lead students to brainstorm about good and bad conductors of heat. ii) Students to identify good and bad conductors of heat.	i) Brass rod ii) Wooden rod iii) Wire gauge	Is the student able to identify good and bad conductors of heat?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) explain how to minimize heat losses due to conduction;	i) The teacher to guide students to discuss how heat losses due to conduction can be minimized. ii) Students to discuss in groups how to minimize heat loss due to conduction.	i) Glass-fibre insulation ii) Foam insulation iii) Thick carpets iv) Curtains v) Draught- excluders.	Is the student able to minimize heat losses due to conduction?	
	d) apply knowledge of conduction in daily life.	i) Students in groups to discuss the selective uses of good and bad conductors of heat in everyday life. ii) The teacher to highlight selective uses of good and bad conductors of heat in everyday life.	Charts with list of good and bad conductors	Is the student able to apply knowledge and conduction in daily life?	
6.2 Convection	The student should be able to: a) explain the concept of convection of heat;	i) The teacher to guide students to demonstrate convection currents in water using crystals of potassium permanganate. ii) Students to demonstrate correction currents in water using crystals of potassium permanganate.	i) Box apparatus ii) Smoke iii) Potassium permanganate iv) Water v) Thermos	Is the student able to explain the concept of convection of heat?	4

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	b) explain convection in fluids in terms of kinetic theory of matter;	i) The teacher to lead students to discuss heat transfer in liquids and gases using the kinetic theory of matter. ii) Students to discuss the formation of sea and land breezes during day and night.	Diagram of sea and land breezes	Is the student able to explain convection in fluids in terms of kinetic of theory matter?	
	c) explain how to minimize heat losses due to convection; and	i) Students to do a library or internet search about methods of minimizing heat losses due to convection. ii) The teacher through question and answer technique to highlight proper methods of minimizing heat losses due to convection.	i) Thermos ii) Website	Is the student able to minimize heat losses due to convection?	
	d) apply knowledge of convection to daily life.	i) The teacher to guide students to discuss the mode of action of domestic hot water supply system. ii) Students to discuss the mode of action of domestic hot water supply system. iii) Students to visit houses with the hot water system.	i) Diagram of a hot water system ii) Houses which have hot system.	Is the student able to apply knowledge of convection in daily life?	

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6.3 Radiation	The student should be able to: a) explain the concept of radiation;	i) The teacher to guide students to brainstorm how heat from the sun reaches the earth's surface. ii) Students in groups to discuss the concept of radiation and vacuum between the sun and the earth's atmosphere. iii) Students to discuss on how thermal radiation can be detected.	i) Thermopile ii) Thermometer	Is the student able to explain the concept of radiation?	4
	b) identify good absorbers and emitters of radiant heat; and	i) The teacher through question and answer technique to highlight good absorbers and emitter of radiant energy. ii) Students to demonstrate that black surfaces are good absorbers and emitters of radiant heat.	i) Thermometer ii) Soot (black body) iii) Concave reflector	Is the student able to identify good absorbers and emitters of radiant heat?	
	c) minimize heat losses due to radiation	i) The teacher to guide students through question and answer technique to describe how to minimize heat losses due to radiation. ii) Students to discuss how to minimize heat losses due to radiation.	i) Water tanks ii) Thermos flask	Is the student able to minimize heat losses due to radiation?	

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		iii) Students to discuss in groups how heat losses due to conduction, convection and radiation are minimized in a thermos flask.			
7.0 MEASUREMENT OF THERMAL ENERGY 7.1 Heat Capacity	The student should be able to: a) explain the factors which determine heat quantity of a substance;	i) The teacher to lead students to discuss the factors which determine heat content of a substance. ii) Students to discuss the factors which determine heat concept of a substance.	i) Heater ii) Thermometer iii) Beaker	Is the student able to explain the factors which determine heat quantity of a substance?	6
	b) determine the heat capacity; and	i) The teacher to guide students to brainstorm the definition of the heat capacity of substance. ii) The teacher to demonstrate to students how to determine the heat capacity and its S.I unit.	i) Calorimeter ii) Thermometer iii) wooden base iv) Beam balance	Is the student able to determine the heat capacity?	
	c) determine the specific heat capacity.	i) The teacher to assist students to do a library search on the concept of specific heat capacity of a substance. ii) The students to discuss the specific heat capacity and its S.I unit.	i) Calorimeter ii) Thermometer iii) wooden base iv) Beam balance v) Website	Is the student able to determine the specific heat capacity?	

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7.2 Change of State	The student should be able to: a) explain the behaviour of particles of matter by applying kinetic theory;	i) The teacher to lead students to demonstrate the behaviour of particles in a solid, liquid and gases. ii) Students to demonstrate the behaviour of particles in a gas by using the smoke cell. iii) Students to explain the behaviour of particles in matter in terms of the kinetic theory of gases.	i) Small pieces of marble or lead shorts ii) Bottle iii) Smoke cell iv) Torch v) (MnO4) vi) Water	Is the student able to explain the behaviour of particles of matter applying kinetic theory?	12
	b) determine experimentally the melting point of a substance from its cooling curve.	i) The teacher to lead students to discuss the concept of melting/freezing points of a substance. ii) The teacher to assist students to perform an experiment to determine the melting point of wax or naphthalene iii) Students to discuss from the graph the melting point naphthalene/wax.	i) Naphthalene or wax test tube ii) Thermometer heater iii) Test tube holder iv) graph paper v) Pencil	Is the student able to determine experimentally the melting point of substance from its cooling curve?	

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	c) demonstrate the effect of impurities on the freezing point and the boiling points of a substance.	i) The teacher to lead students to demonstrate the effect of the impurities of the freezing point of water. ii) Students to find out the effect of impurities on the boiling and freezing point of substance.	i) Water ii) Salt iii) Heater iv) Beaker	Is the student able to demonstrate the effect of impurities on freezing and boiling points of a substance?	
	d) demonstrate the effect of pressure on the boiling point and freezing point of a substance;	i) The teacher to lead students to demonstrate the effect of pressure on the boiling point and freezing point of water. ii) Students to find out the effect of pressure on boiling point and freezing point of liquids.	i) Conical flask ii) Rubber band iii) Thermometer iv) Water v) Other liquids	Is the student able to demonstrate the effect of pressure on boiling and freezing points?	
	e) explain the phenomenon of regulation;	i) The teacher to lead students to demonstrate the phenomenon of regulation. ii) Students to discuss in groups the concept of regulation.	i) Block of ice ii) Weights iii) Thin wire	Is the student able to explain the phenomenon of regulation?	

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	f) describe the concept of boiling and evaporation in respect to the kinetic theory of matter.	i) The teacher to lead students through question and answer to describe the concept of boiling and evaporation in terms of kinetic theory of matter. ii) Students in groups to discuss the concept of boiling and evaporation in terms of kinetic theory.	i) Heater ii) Water iii) Beaker	Is the student able to describe the concept of boiling and evaporation in respect to the kinetic theory of matter?	
	g) demonstrate latent heat of fusion and vaporization; and	i) The teacher to guide students to discuss in groups, the concept of the specific latent heat of fusion and vaporization of substance and its SI units. ii) Students to perform an experiment of heating water into vapour and plot the temperature time graph water and deduce the latent heat of vaporization. iii) Students to perform an experiment of cooling naphthalene and deduce the definition of specific latent heat of fusion of a substance.	i) Beaker ii) Thermometer iii) Heater iv) Water	Is the student able to demonstrate the latent heat of vaporization and fussion?	

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	h) describe the mechanism of refrigeration.	i) The teacher to display a chart diagram of refrigerator and lead the students to discuss the parts of a refrigerator. ii) The students to discuss the parts of a refrigerator.	i) Chart showing the diagram of refrigerator. ii) Refrigerator	Is the student able to describe the mechanism of a refrigerator?	
8.0 VAPOUR AND HUMIDITY 8.1 Vapour	The student should be able to: a) explain the process of evaporation of liquid;	i) The teacher to lead the students to discuss the concept of evaporation of liquids. ii) Students to explain the concept of evaporation of liquids.	i) Volatile liquid (ether) ii) Spirit	Is the student able to explain the process of evaporation of a liquid?	4
	b) identify factors affecting evaporation of a liquid;	i) The teacher to assist students to brainstorm the effect of temperature, pressure, surface area of the liquid nature of liquid and atmospheric conditions on evaporation. ii) Students to discuss the factors affecting evaporation.	i) Bottle ii) Basin iii) Hot water	Is the student able to identify factors affecting evaporation of a liquid?	

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	c) distinguish between saturated and unsaturated vapours; and	i) The teacher to lead students' discussion on evaporation of drops of a volatile liquid above the surface of mercury in a simple barometer. ii) Students to distinguish saturated from unsaturated vapours.	i) Ether ii) Conical flask	Is the student able to distinguish between saturated and unsaturated vapours?	
	d) explain the effect of temperature on saturated vapour pressure (S.V.P) of a liquid.	i) The teacher to lead students through question and answer technique to explain the effect of temperature on saturated vapour pressure (S.V.P) of a liquid. ii) Students to discuss the SVP of volatile liquid due to temperature rise.	i) Ether ii) Source of heat	Is the student able to explain the effect of temperature on saturated vapour pressure (SVP) of a liquid?	
8.2 Humidity	The student should be able to: a) explain the concept of humidity;	i) The teacher to lead students to discuss the concept of humidity. ii) Students to discuss the concept of humidity.	i) Beaker ii) Ice blocks	Is the student able to explain the concept of humidity?	4

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	b) explain the formation of dew;	i) The teacher to lead the students to do a library or internet search to explain the process of dew formation and the factors which influence the formation of dew. ii) Students to demonstrate dew point in laboratory and explain factors which influence the formation of dew.	i) Water can ii) Thermometer iii) Ice cubes iv) Water	Is the student able to explain the formation of dew?	
	c) measure relative humidity;	i) The teacher to lead students to demonstrate how to determine the Relative Humidity of air, using the wet and dry bulb hygrometer. ii) Students to find relative humidity from the dew point using Renault's hygrometer.	i) Wet and dry bulb ii) Hygrometer iii) Renault's iv) hygrometer	Is the student able to measure relative humidity?	
	d) apply the knowledge of humidity in daily life.	i) The teacher to lead students to discuss the effects of relative humidity in everyday life. ii) Students to discuss the effects of relative humidity in everyday life.	i) Glass ii) Car Screen iii) website	Is the student able to apply the knowledge of humidity in daily life?	

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9.0 CURRENT ELECTRICITY 9.1 Electromotive Force (e.m.f) and Potential Difference (P.d)	The student should be able to: a) explain the concept of electromotive force (e.m.f) and potential difference (p.d);	i) The teacher to guide students to brainstorm the concept of electromotive force and potential difference. ii) Students to discuss the concept of electromotive force and potential difference.	i) Electric cell ii) Voltmeter iii) Switch/key iv) Resistance v) Ammeter	Is the student able to explain the concept of electromotive force and potential difference?	2
	b) state the S.I units of electromotive force and potential difference; and	i) The teacher to guide students through question and answer technique to state the units of electromotive force and potential difference. ii) Students to state the units of electromotive force and potential difference.	i) Charts ii) Ammeter iii) Voltmeter iv) Website	Is the student able to state the S.I units of electromotive force and potential difference?	
	c) measure electromotive force of a cell and potential difference across a conductor.	i) The teacher to guide students to demonstrate how to measure the electromotive force of a cell and potential difference across a conductor. ii) Students to measure electromotive force of a cell and potential difference across a conductor.	i) Electric cell ii) Switch/key iii) Conductor iv) Voltmeter v) Ammeter	Is the student able to measure the electromotive force of a cell and the potential difference across a conductor?	

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9.2 Resistance to Electric Current	The student should be able to: a) explain the concept of electric current in a conductor;	i) The teacher to guide students to discuss the concept of electric current in a conductor. ii) Students to discuss on how movement of charged particles causes electric conductor. iii) The teacher and students to derive the relation between electric charge and time.	i) Cell ii) Conductor iii) bulb iv) Connecting wires	Is the student able to explain the concept of electric current in a conductor?	8
	b) describe factors which determine the resistance of a conductor;	i) The teacher to guide students to describe factors which determine the resistance of a conductor ii) students to describe factors which determine the resistance.	i) Different wire ii) Micrometre screw gauge iii) Ammeter iv) Voltmeter	Is the student able to describe factors which determine the resistance of a conductor?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine the relationship between potential difference (Pd) across the conductor and current;	i) The teacher to lead students to demonstrate how to determine the relationship between potential difference across the conductor and current. ii) Students to determine the relationship between potential difference across the conductor and current.	i) Cell, switch ii) Voltmeter iii) ammeter iv) Rheostat v) Connecting wire	Is the student able to determine the relationship between potential difference across the conductor and current?	
	d) identify types of resistors;	i) The teacher to display various types of resistors. ii) Students to identify various resistors and their modes of action.	i) Charts with different types of resistors	Is the student able to identify various types of resistors?	
	e) determine the equivalent resistance of more than two resistors in series and parallel;	i) The teacher to guide students to determine the equivalence resistance in series and parallel. ii) Students to determine the equivalence resistance of more than two resistors.	i) Rheostat ii) Resistance box iii) Ammeters iv) Connecting wires v) Switch/key vi) Electric cell	Is the student able to determine the equivalence resistance of more than two resistors in series and parallel?	

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	f) explain the mode of action of a Wheatstone bridge and Potentio-meter	i) The teacher to demonstrate and explain the mode of action of a Wheatstone bridge and Potentio-meter. ii) Students to perform an experiment to determine unknown resistance	i) Resistors ii) Wheat stone bridge iii) Connecting wires iv) Dry cells v) Unknown resistance	Is the student able to describe the mode of action of a Wheatstone bridge and Potentio- meter?	
	g) Connect and analyse a simple electric circuit.	i) The teacher to lead students to connect and analyse simple electric circuits ii) Students to connect and analyse simple electric circuits.	i) Resistors ii) Bulb iii) Connecting wires iv) Key /switch	Is the student able to connect and analyse simple circuits?	
9.3 Effects of an Electric Current	The student should be able to: a) explain the mechanism of heating by electric current;	i) Teacher to guide students to discuss the mechanism of heating by electric current. ii) Students to discuss the mechanism of heating of electric current. iii) The teacher to guide students to demonstrate the conversion of electrical energy to heat energy a using a heating element.	i) Heating element ii) Power source	Is the student able to explain the mechanism of heating by electric current?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) describe factors which determine the quantity of heat generated in a conductor due to a current;	i) Students to carry out an experiment to investigate the relationship between heat, time and resistance of a conductor. ii) The teacher to guide students to carry out an experiment to investigate the relationship between heat generated in a conductor and the current, the current is passed and its resistance. iii) Students to state joule's law of heat and S.I unit of electrical energy.	i) Heating element ii) Power source	Is the student able to describe the factors which determine the quantity of heat generated in a conductor due to a current?	
	c) determine electrical power; and	i) The teacher to lead students to the definition of electrical power from the general definition of power and its S.I unit. ii) Student to determine the electrical power.	i) Charts ii) website	Is the student able to determine electrical power?	
	d) interpret the power rating of electrical appliances.	i) The teacher to guide students to discuss electrical appliance power ratings. ii) Students to discuss the commercial unit of electrical energy consumption in everyday life (kilo watt – hours)	i) Heating element ii) Electric iron iii) Electric kettle iv) Electric bulb	Is the student able to interpret the power rating of electrical appliances? Is the student able to read the electric meter?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
9.4 Electric Installation	The student should be able to: a) explain the meaning of the letters E (Earthing) L (Live) and N (Neutral) in electrical wiring.	i) The teacher to lead students to discuss the meaning of the letters E, L, N electrical wiring regarding their colours. ii) Students to open a three-pin plug and wire correctly according to the colours.	i) Three-pin plug ii) Electrical installation board	Is the student able to wire the three-pin plug?	4
	b) describe the functions of a fuse and a circuit breaker;	i) The teacher to display different types of fuses and guide students to demonstrate the melting of a fuse wire by our loading it. ii) Students to discuss the properties, materials, melting and functions of a fuse and functions of a circuit breaker.	i) Copper ii) Fuse for lighting circuit iii) Fuses for power circuit iv) Fuse wires	Is the student able to describe the function of a fuse and circuit breaker?	
	c) perform wiring on a board; and	i) Teacher to guide students to perform wiring on aboard. ii) Students to perform wiring on a board.	i) Wiring board ii) Connecting wire	Is the student able to perform wiring on a board?	
	d) check and rectify electrical faults in domestic appliances.	i) Students to discuss how to check and rectify electrical faults in domestic appliances. ii) The teacher to guide students to discuss how to check and rectify electrical faults in domestic appliances.	i) Electric iron ii) Electric kettle	Is the student able to check and rectify electrical faults in domestic appliances?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
9.5 Cells	The student should be able to: a) describe the mode of action of a dry cell (Leclanche);	i) The teacher to display to students the dry cell. ii) Students to draw the dry cell and label its parts. iii) Student to discuss the construction and mode of action of the Leclanche (dry cell).	Dry cells	Is the student able to describe the mode of action of the Leclanche (dry cell)?	6
	b) determine voltage combination of cells in series and parallel	i) The teacher to guide students to determine voltage combination of cells in series and parallel. ii) Students to compute voltage combinations in series and parallel.	Charts with series and parallel combination	Is the student able to determine voltage of combination of cells in series and parallel?	
	c) identify the cell defects;	i) The teacher to lead students to identify the cell defects. ii) Students to discuss and identify the cell defects.	Dry cells	Is the student able to identify cell defects?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) describe the mode of action of lead-acid accumulator;	i) The teacher to lead students to describe the mode of action of a lead-acid accumulator. ii) Students to discuss mode of action of a lead-acid accumulator.	i) Dry cells ii) Lead-acid accumulator	Is the student able to discuss the mode of action of a lead-acid accumulator?	
	e) explain the charging and discharging phenomenon of an accumulator; and	i) The teacher to guide students to explain the charging and discharging process of an accumulators ii) Students to discuss the charging and discharging phenomenon of an accumulator.	i) Lead-acid accumulator ii) Battery charger	Is the student able to explain the charging and discharging phenomenon of an accumulator?	
	f) use cells and accumulators in daily life.	i) The teacher to guide students to identify the applications of dry cells in daily life. ii) Students to use cells and accumulators in daily life.	i) Dry cells ii) Lead-acid accumulator	Is the student able to use cells and accumulators in daily life?	

FORM FOUR

CLASS LEVEL COMPETENCES

Student should have the ability to: -

1) apply concepts of waves and electromagnetic induction in daily life;
2) use the knowledge of thermionic and radioactive emission in interacting with environment;
3) design and implement the simple electronic circuits;
4) apply theories of solar system and other celestial bodies;
5) describe the occurrence of environmental disasters.

CLASS LEVEL OBJECTIVES

By the end of Form Four course, the students should be able to: -

1) understand the laws and principles of waves and electromagnetic induction;
2) realize the importance and hazards of thermionic and radioactive emission;
3) understand basic building unit for electronic circuit;
4) promote knowledge on the solar system and relationship with other celestial bodies;
5) develop knowledge on the occurrence of environmental disasters.

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.0 WAVES 1.1 Introduction to Waves	The student should be able to: a) explain the concept of a wave;	i) The teacher to guide students to brainstorm the concept of waves. ii) Students in groups to discuss the concept of waves. iii) The teacher to lead students to demonstrate the production of waves.	i) Slinky spring ii) Rope, ripple tank iii) Vibrator iv) Tuning fork	Is the student able to explain the concept of a wave?	6
	b) explain the terms wave length, frequency and velocity of a wave; and	i) The teacher through questions and answers technique to assist students to explain the terms: wavelength (λ), frequency (f) and velocity (v) of a wave. ii) Students to explain the wavelength, frequency and velocity of the wave.	Chart showing graph of displacement against time.	Is the student able to explain the terms wavelength, frequency and velocity of a wave?	
	c) identify types of waves.	i) Teacher to guide students to demonstrate the types of waves. ii) Students in groups to identify types of waves.	i) Helical spring ii) Drum iii) Light	Is the student able to identify types of wave?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.2 Behaviour of Waves	The student should be able to: a) explain reflection, refraction, diffraction and interference of waves.	i) The teacher to demonstrate to students the behaviour of waves: reflection, diffraction and interference. ii) Students to explain refraction, reflection, diffraction and interference of waves.	i) Ripple tank ii) Rectangular prism iii) Two metal rods iv) Vibrator v) water vi) source of power vii) white board/sheet	Is the student able to explain reflection, refraction, diffraction and interference of waves?	8
	b) mention the application of reflection, refraction, diffraction and interference of waves in daily life; and	i) The teacher to guide students to brainstorm on the applications of reflection, refraction, diffraction and interference of waves. ii) By using Think-Pair-Share technique students to mention the applications of reflection, refraction, diffraction and interference of waves. iii) The teacher to guide students to present their answers and make conclusion.	i) Radio ii) TV iii) Mobile phone	Is the student able to mention the applications of reflection, refraction, diffraction and interference of waves in daily life?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) demonstrate the behaviour of waves.	i) The teacher to assist students to demonstrate the behaviour of waves. ii) Students in groups to demonstrate reflection, refraction, diffraction and interference of waves.	i) Ripple tank ii) Rectangular prism iii) Vibrator iv) water v) source of power vi) white board/sheet	Is the student able to demonstrate behaviour of waves?	
1.3 Propagation of Waves	The student should be able to: a) describe the propagation of mechanical waves.	i) Teacher to use question and answer technique to assist students to describe the propagation of mechanical waves ii) Students in groups to describe the propagation of mechanical waves iii) Teacher to guide students to demonstrate propagation of mechanical waves	i) Slinky spring ii) Turning fork iii) Ripple tank iv) Rope v) Wall vi) Smooth table/floor	Is the student able to describe the propagation of mechanical waves?	10
	b) explain the propagation of electromagnetic waves.	i) Teacher to apply question and answer technique to explain the propagation and answer to explain the propagation of electromagnetic waves ii) Students in groups to discuss the propagation of electromagnetic waves. iii) Students in groups to demonstrate the propagation of electromagnetic waves	Chart showing the electromagnetic spectrum	Is the student able to explain the propagation of electromagnetic waves?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine the relation between frequency, speed and wavelength of a wave; and	i) The teacher through question and answer technique to lead students to determine the relationship between frequency, speed and wavelength ii) Students to describe frequency from the equation $f = \frac{v}{\ddot{e}}$ and state its S.I. units.	Chart showing the relationship between frequency, speed and wavelength.	Is the student able to determine the relation between frequency, speed and wavelength of a wave?	
	d) determine the refractive index of a medium.	i) The teacher to guide students through Think-Pair-Share to determine the refractive index of a medium. ii) Students to determine the refractive index of a medium.	i) Glass block ii) Pins iii) White sheet iv) Protector v) Ruler vi) Drawing board.	Is the student able to determine the refractive index of a medium?	
1.4 Sound Waves	The student should be able to:- a) identify sources of sound waves;	i) The teacher to guide students to discuss the sources of sound waves. ii) Students to produce sound waves by using different sources of sound.	i) Drum ii) Guitar iii) Whistle iv) iv) Tuning fork	Is the student able to identify sources of sound waves?	10
	b) explain the concept of audibility range;	i) The teacher through question and answer technique to guide students explains the concept of audibility range. ii) Students to explain the concept of audibility range.	i) Model of the human ear ii) Table with audibility range	Is the student able to explain the concept of audibility range?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) describe the perception of hearing; and	i) The teacher to assist students through question and answer technique to describe the perception of hearing. ii) Students to describe the perception of hearing.	Model of the human ear	Is the student able to describe the perception of hearing?	
	d) explain the concept of echo and reverberation of sound.	i) The teacher to guide students to demonstrate the production of an echo. ii) Students to explain the concept of echo and reverberation of sound.	i) Tall wall ii) Hall iii) Source of sound iv) Sound absorbing material (cloth, spongy material)	Is the student able to explain the concept of echo and reverberation of sound?	
	e) determine the speed of sound in air.	i) The teacher to lead students to demonstrate how to measure the speed of sound in air. ii) Students to perform an experiment to measure the velocity of sound in air. iii) Students to determine the speed of sound in air.	i) Resonance tube ii) Metre rule iii) Water iv) Turning fork v) Long tube	Is the student able to determine the speed of sound in air?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
1.5 Musical Sound	The student should be able to: a) explain the concept of a musical sound;	i) Teacher to guide students to brainstorm the concept of musical sound. ii) Students explain the concept of a musical sound.	i) Guitar ii) Drum iii) Sonometer iv) Tuning forks v) Violin vi) Flute	Is the student able to explain the concept of musical sound?	15
	b) identify factors affecting loudness, pitch and quality of a musical sound.	i) The teacher to lead students through question and answer technique to identify factors affecting loudness pitch and quality of musical sound. ii) Student to identify factors affecting loudness, pitch and quantity of musical sound.	i) Drum ii) Guitar iii) Microphone iv) Cathode rays oscilloscope	Is the student able to identify factors affecting loudness, pitch and quality of musical sound?	
	c) identify the different musical instruments.	i) The teacher to organize study visit for student to identify different types of musical instrument. ii) Students to distinguish different musical instrument by listening to the musical sounds they produce.	i) Pipe musical instruments ii) String musical instruments iii) Membrane musical iv) instruments v) Electronic musical instruments.	Is the student able to identify the different musical instrument?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) explain the terms stationary wave, nodes and antinodes;	i) The teacher to lead students to brainstorm the terms of standing (stationary) wave, nodes and antinodes. ii) Students to explain the terms; nodes, antinodes, crest and trough as applied in stationary waves.	i) Slinky spring ii) Vibrator iii) Marker pen iv) White sheet	Is the student able to explain the terms applied stationary waves?	
	e) determine the frequency of a musical note; and	i) The teacher to guide students to perform an experiment to determine the factors which affect the frequency of a note by stretched string. ii) Students to carry out an experiment to determine factors which affect the frequency of a note produced by a stretched string. iii) Students to determine the frequency of a musical note.	i) Strings ii) Sonometer iii) Tuning forks iv) masses/load	Is the student able to determine the frequency of a musical note?	
	f) distinguish between the fundamental note and overtones.	i) The teacher to lead students through question and answer technique to distinguish between fundamental note and overtones. ii) The students to distinguish between fundamental note and overtones.	i) Resonance tube ii) Tuning forks iii) Water iv) Beaker v) Retort stand vi) Tall jar	Is the student able to distinguish between the fundamental notes and overtones?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	g) explain the concept of resonance as applied to sound.	i) The teacher to lead students to brainstorm the concept of resonance as applied to sound. ii) Students to demonstrate and explain resonance as applied to sound.	i) Sounding boxes ii) Resonance tube iii) Tuning forks iv) Water	Is the student able to explain the concept of resonance as applied to sound?	
	h) construct a simple musical instrument.	i) The teacher to invite an expert to support students to construct a simple musical instrument. ii) Students to imitate the construction of simple musical instrument.	i) Wires of different diameter ii) Nails iii) Membrane iv) Empty can of 5 litres v) Wooden rod	Is the student able to construct a simple musical instrument?	
1.6 Electromagnetic Spectrum	The student should be able to: a) explain the concept of the electromagnetic spectrum.	i) The teacher to guide students to discuss the concept of the electromagnetic spectrum. ii) Students to explain the concept of electromagnetic spectrum.	Chart showing electromagnetic spectrum	Is the student able to explain the concept of the electromagnetic spectrum?	10

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) identify the main bands of the electromagnetic spectrum.	i) The teacher to guide students through question and answer technique to describe the electromagnetic spectrum. ii) Students to identify the main bands of the electromagnetic spectrum.	i) Glass prism ii) Rain bow	Is the student able to identify the main bands of the electromagnetic spectrum?	
	c) detect infra-red, visible and ultra- violet rays.	i) The teacher to guide students in groups to demonstrate how to detect infra-red rays, visible and ultra-violet rays. ii) Students in groups to detect the infra-red rays, visible and ultra-violet rays.	i) Thermometer ii) Iron iii) Heater iv) Sun rays	Is the student able to detect infra-red visible and ultraviolet rays?	
1.7 Applications of Eletromagnetic Wave in Daily Life	The student should be able to: a) identify the application of microwaves, radio-waves, infra-red, gamma rays and x-rays; and	i) The teacher to guide students to discuss the applications of microwaves, radio-waves, infra-red, gamma rays and x-rays. ii) Through think-pair-share technique students to identify the applications of microwaves, radio-waves, infra-red, gamma rays and x-rays.	i) Radio ii) TV iii) Hospital equipment iv) Domestic materials v) Mobile phone	Is the student able to identify the applications of microwaves, radio- waves, infra-red, gamma rays and x-rays?	6

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain the importance of electromagnetic waves in Agriculture and climate.	i) The teacher to support students to perform a project work on the importance of electromagnetic waves in agriculture and climate. ii) Students to carry out the project work on the importance of electromagnetic waves in agriculture and climate.	i) Chart of different climate ii) Green leaves, iii) Sun light, water	Is the student able to explain the importance of electromagnetic wave in agriculture and climate?	
2.0 ELECTROMAGNETISM 2.1 Magnetic fields due to a current – carrying conductor	The student should be able to: a) explain how electric current produces a magnetic field;	i) The teacher to assist students to brainstorm how electric current produce magnetic field. ii) Students to perform an experiment to produce magnetic field due to a current carrying wire.	i) long wire ii) Sources of electric current iii) Compass needle/iron fillings iv) Rheostat v) Connecting wires	Is the student able to explain how electric current produce a magnetic field?	8
	b) identify the pattern of the magnetic field lines around a straight conductor;	i) The teacher to guide students to carry out experiments to investigate the magnetic fields associated with an electric current passing through a straight wire, loop and solenoid. ii) Students to identify the patterns of the field lines around a straight conductor, loop and solenoid.	i) Card board i ii) Iron fillings iii) Source of electricity iv) Straight conductor v) circular coil vi) Solenoid	Is the student able to identify the pattern of the magnetic field lines around a straight conductor?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	c) determine the direction of magnetic field around a current-carrying conductor;	i) The teacher to guide students to discuss the right hand rule and the cork screw rule. ii) Students to state the right hand rule and the cork screw rule. iii) The teacher to assist students through question and answer technique to determine the direction of magnetic field due to the current flowing through a straight wire, loop and solenoid.	cork screw	Is the student able to determine the direction of magnetic field around a current-carrying conductor?	
	d) determine presence and direction of a force on a current- carrying conductor in a magnetic field; and	i) The teacher to demonstrate to students on how to determine the direction of the force acting on a current carrying conductor placed at right angle to a magnetic field. ii) Students to apply Fleming's left hand rule to tell direction of a force due to a current carrying conductor.	i) Stiff wire ii) Horse shoes magnet iii) connecting wire iv) Source of power	Is the student able to determine the presence and direction of force in a magnetic field?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) determine the direction of force due to two current-carrying conductors when the current is flowing in the same or opposite directions.	i) The teacher to guide students through question and answer technique to determine the attraction and repulsion of currents flowing through parallel wires. ii) Students to perform an experiment to show the directions of repulsion and attraction force.	i) Connecting wires ii) Keys iii) Aluminium strips iv) Metre rule v) Source of electricity	Is the student able to determine the direction of force when the current is flowing in the same or opposite directions?	
2.2 Electromagnetic Induction	The student should be able to: a) explain the concept of electromagnetic induction;	i) The teacher to guide students to demonstrate the production of induced current using a coil and a magnet. ii) The teacher to guide the students to explain the concept of electromagnetic induction. iii) Students by using Think-Pair-Share technique to explain electromagnetic induction.	i) Connecting wires ii) Magnet iii) Galvanometer iv) Coil wound on a soft paper/ solenoid	Is the student able to explain the concept of electromagnetic induction?	12

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) state the laws of electromagnetic induction;	i) The teacher to guide students to discuss laws of electromagnetic induction. ii) Students to state and explain the Faraday's Laws of electromagnetic induction. iii) Students to apply Faraday's Laws and Lenz's Law of electromagnetic induction to demonstrate the factors affecting magnitude of induced electromotive force and direction of induced current.	i) Coil/solenoid ii) Bar magnet iii) Galvanometer iv) Connecting wires	Is the student able to state the laws of electromagnetic induction?	
	c) explain the concepts of self and mutual induction;	i) The teacher to guide students to brainstorm the concepts of self-induction and mutual induction. ii) Students to explain the concepts of self-induction and mutual induction.	i) Source of electricity ii) Soft iron ring iii) Key iv) Galvanometer. v) Connecting wires vi) Rheostat vii) Two long insulated wires	Is the student able to explain concepts of self and mutual induction?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	d) describe the mode of action of induction coil;	i) The teacher to demonstrate to students the structure diagram of an induction coil to the students and guide them on how it works. ii) Students to describe the mode of action of an induction coil.	i) Induction coil ii) Chart of induction coil	Is the student able to describe the mode of action of the induction coil?	
	e) describe the mode of action of a.c. and d.c. generator; and	i) The teacher to assist to the students to discuss the flow of a.c. and d.c. from a coil rotating in a magnetic field. ii) Students to explain the flow of a.c. from a coil rotating in a magnetic field. iii) The teacher to explain the mode of action of a.c. and d.c. generators and how to convert a.c. generator to d.c. generator. iv) The teacher and students to discuss the applications of a.c. generator and the advantages of a.c over d.c generator.	i) Chart of a coil rotating in magnetic field ii) Chart of a.c. and d.c. generator	Is the student able to explain the mode of action of an a.c. and a d.c. generator?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	f) construct a simple step-up and step-down transformer.	i) The teacher to guide students to demonstrate the construction of a simple step-up and step-down transformer. ii) Students to explain the mode of action of a transformer. iii) The teacher through enquiry deductive technique to guide students to develop the following relationships $\frac{E_s}{E_p} = \frac{N_s}{N_p}$ and apply this formula to solve problems. iv) The teacher to guide students to discuss the application of a transformer.	i) Soft iron core ii) Wax/ Candle iii) Insulated copper wire iv) voltmeter v) Low voltage power supply	Is the student able to construct simple step-up and step- down transformer?	
3.0 RADIOACTIVITY 3.1 The Nucleus of an Atom	The student should be able to: a) describe the structure of the nucleus of an atom;	i) Teacher to guide students to discuss the structure of an atom. ii) Students in groups to discuss the structure of the atom.	i) Chart of atom ii) Model of an atom	Is the student able to describe the structure of the nucleus of an atom?	4

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) explain the atomic number, mass number and isotopes of an element and their symbols; and	i) Teacher to assist students to brainstorm the meaning of atomic number, mass number and isotopes of an element. ii) By means of Think-Pair-Share technique students to discuss the meaning of atomic number, mass number and isotopes of the elements.	i) Model showing atomic number, mass number of elements ii) Playing cards	Is the student able to explain the atomic number, mass number and isotopes of an element?	
	c) mention forces holding the nucleus.	i) Teacher to assist students through question and answer technique to describe the existence of forces holding the nucleus. ii) Students in groups to mention the forces holding the nucleus.	Charts showing electron and proton in an atom	Is the student able to mention forces holding the nucleus?	
3.2 Natural Radioactivity	The student should be able to: a) explain the concept of radioactivity;	i) The teacher to guide students to discuss the concept of radioactivity. ii) Students to explain the concept of radioactivity.	i) Dice ii) Container/ Can iii) Periodic table	Is the student able to explain the concept of radioactivity?	8

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	b) describe properties of the radiations emitted by radio-active substances;	i) The teacher to guide students to brainstorm the properties of alpha (α), beta (β) and gamma (γ) radiations. ii) Students in groups to describe the properties of radiations emitted by radioactive substances.	Chart of bombarding elements	Is the student able to describe properties of the radiations emitted by radioactive substances?	
	c) explain the nuclear changes due to the emission of alpha(α), beta (β) and gamma (γ) radiations;	i) The teacher to assist students to discuss the nuclear changes due to the emission of (α), beta (β) and gamma (γ) radiations. ii) Students to explain in groups the nuclear changes due to emission of (α), beta (β) and gamma (γ) radiations.	i) Periodic table ii) Chart showing emission of (α), beta (β) and gamma (γ) radiations	Is the student able to explain the nuclear changes due to the emission of alpha (α), beta (β) and gamma (γ) radiations?	
	d) explain the detection of (α), (β) and (γ) radiations;	i) The teacher to guide students to demonstrate the detection of (α), beta (β) particles using Geiger Muller Counter, or Spark Chamber or Wilson Cloud Chamber. ii) The students use detectors to detect (α), beta (β)particles. iii) The teacher to guide students to detect γ rays using photographic plat.	i) Geiger Muller counter ii) Wilson Cloud Chamber iii) Spark Chamber iv) Photographic plat	Is the student able to explain the detection of (α), beta (β) and gamma (γ) radiations?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
	e) describe half- life as applied to a radioactive substance;	i) The teacher to guide students to brainstorm the meaning of half-life as applied to a radioactive substance and highlights the meaning of background radiation. ii) Students to demonstrate the half-life using dice.	i) Graph showing radioactivity ii) Dice iii) Graph paper	Is the student able to describe half-life as applied to a radioactive substance?	
	f) determine the half-life of a radioactive element; and	i) The teacher to demonstrate how to determine half-life using various methods. ii) Students in groups to determine half-life of radioactive elements.	i) Graph of count-rate against time ii) Graph paper iii) Pencil iv) Burette v) Retort stand vi) Beaker vii) Water viii) Stop watch	Is the student able to determine the half-life of a radioactive element?	
	g) identify the applications of natural radioactive substances.	i) The teacher to guide the students to brainstorm the application of radio isotopes. ii) Students in groups to identify the applications of radio isotopes in agriculture, medicine and industry.	i) Chart ii) Marker pen	Is the student able to identify the applications of radio isotopes in daily life?	

TOPICS/SUB-TOPICS	SPECIFIC OBJECTIVES	TEACHING AND LEARNING STRATEGIES	TEACHING AND LEARNING RESOURCES	ASSESSMENT	NO. OF PERIODS
3.3 Artificial Radioactivity	The student should be able to: a) distinguish between natural and artificial radioactivity;	i) Teacher to guide students to discuss the natural and artificial radioactive isotopes. ii) Students to distinguish between natural and artificial radioactivity.	i) Chart showing natural and artificial radioactivity ii) Periodic table	Is the student able to distinguish between natural and artificial radioactivity?	4
	b) describe methods of producing artificial radioactive isotopes; and	i) The teacher to assist students to discuss methods of producing artificial radioactive isotopes. ii) Students in groups to describe methods of producing artificial radioactive isotopes.	Chart of bombarding elements	Is the student able to describe methods of producing artificial radioactivity?	
	c) mention the applications of artificial radioactivity.	i) The teacher to guide students to brainstorm the applications of artificial radio activity. ii) The students to use library search technique to write down uses of artificial radioactivity.	Chart showing use of artificial radioactivity	Is the student able to mention applications of artificial radioactivity?	
3.4 Radiation Hazards and Safety	The student should be able to: a) explain the effects of nuclear radiations on human body; and	i) Teacher to guide students to discuss the effects of nuclear radiations on human body. ii) Students in group to explain the effect of nuclear radiation on human body.	Chart showing the hazards of radiations	Is the student able to explain the effects of nuclear reactions on human body?	2

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	b) protect himself/ herself from nuclear radiation hazards;	i) Teacher to lead students' discussion about protection from the nuclear radiations. ii) Students to demonstrate using role play on how to protect themselves from nuclear radiations.	i) Radioactive shield ii) Picture showing people working with radioactive materials	Is the student able to protect himself/ herself from nuclear radiation hazards?	
3.5 Nuclear Fission and Fusion	The student should be able to: a) explain the nuclear fission and fusion;	i) Teacher to assist the students to brainstorm the concept of nuclear fission and fusion. ii) Students to explain the nuclear fission and fusion.	Chart showing nuclear fission and fusion	Is the student able to explain nuclear fission and nuclear fusion?	2
	b) mention the applications of nuclear fission and fusion.	i) Teacher to guide students by using Think-Pair-Share technique to mention the applications of nuclear fission and fusion. ii) Students in groups to mention the applications of nuclear fission and fusion.	i) Chart of nuclear weapons ii) Chart of nuclear power station	Is the student able to mention the applications of nuclear fission and fusion?	

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4.0 THERMIONIC EMISSION 4.1 Cathode Rays	The student should be able to: a) explain the production of cathode rays;	i) The teacher to demonstrate to students the production of cathode rays. ii) Students explain the production of cathode rays.	i) Cathode ray tube ii) Chart showing cathode ray tube	Is the student able to explain the production of cathode rays?	4
	b) state the properties of cathode rays;	i) The teacher to facilitate students to brainstorm the properties of cathode rays. ii) Students to state properties of cathode rays.	Chart showing properties of cathode rays	Is the student able to state the properties of cathode rays?	
	c) state the applications of cathode ray tube.	i) The teacher to assist students to discuss the applications of cathode ray tube. ii) The students to state the applications of cathode ray tube.	i) TV ii) Computer iii) Maltose cross iv) Paddle wheel	Is student able to use the cathode ray tube in daily life?	
4.2 X - rays	Student should be able to: a) describe the structure and mode of action of the X-ray tube;	i) The teacher to guide students to brainstorm the structure and mode of action of the X-ray tube. ii) Students to draw and label the diagram of the X-ray tube. iii) Students to describe the structure and mode of action of an X-ray tube.	Charts showing X-rays tube	Is the student able to describe the mode of action of X-ray tube?	4

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	b) distinguish between soft and hard X-rays and their production;	i) Through question and answer technique teacher to guide students to distinguish between soft and hard X-rays and their production. ii) Student in groups to distinguish between soft and hard X-rays.	Coolidge tube model	Is the student able to distinguish soft and hard X-rays?	
	c) state the properties of X-rays; and	i) The teacher to guide students through question and answer technique to state the properties of X-rays ii) Student to brainstorm on the properties of X-rays.	i) Charts showing X-rays tube ii) Electromagnetic spectrum	Is the student able to state the properties of X-rays?	
	d) identify the applications of X-rays in daily life.	i) Student to discuss the applications of X-rays in daily life. ii) The teacher to arrange for the students to study visit to the X-rays in diagnosis of patients. iii) Students to write notes on their educational trip.	i) X-ray unit centre ii) X-rays photographic plate	Is the student able to identify the applications of X-rays in daily life?	

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5.0 ELECTRONICS 5.1 Semiconductors	The student should be able to: a) explain the concept of energy bands in solids;	i) The teacher to guide students through question and answer technique to explain the concept of energy bands in solids. ii) Students to draw the energy bands in solids.	Chart of energy and in solid	Is the student able to explain the concept of energy bands in solids?	6
	b) distinguish between conductors, semiconductors and insulators;	i) The teacher to guide students to discuss the difference between conductors, semiconductors and insulators. ii) Students to distinguish between conductors, semiconductors and insulators.	i) Conductors ii) Semiconductors iii) Insulators iv) Battery v) Galvanometer vi) Connecting wires	Is the student able to distinguish between conductors, semiconductors and insulators?	
	c) describe the effects of temperature on the conductivity of conductors, semiconductors and insulators;	i) The teacher to guide students through question and answer technique to describe the effects of temperature on conductivity of conductors, semiconductors and insulator. ii) Students to describe the energy levels of conductors, semiconductors and insulators.	Chart of energy levels for Conductor; Semiconductor and Insulator.	Is the student able to describe the effect of temperature on the conductivity of conductors, semiconductors and insulators?	
	d) identify types of semiconductors; and	i) The teacher to guide students to brainstorm the types of semiconductors. i) Students to identify types of semiconductors.	i) Silicon ii) Germanium	Is the student able to identify types of semiconductors?	

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	e) describe the mechanism of doping intrinsic semiconductors.	i) The teacher to guide students to discuss the mechanism of doping impurities in intrinsic semiconductors. ii) Students to describe the mechanism of doping intrinsic semiconductors.	Chart showing doping process.	Is the student able to describe the mechanism of doping intrinsic semiconductors?	
5.2 Diodes	The student should be able to: a) describe the construction of P-N junction;	i) The teacher to lead students to demonstrate the construction of a P-N junction. ii) Students to describe the structure of a P-N junction.	i) Chart showing diode. ii) P-N junction diode	Is the student able to explain mode of action of P-N junction?	4
	b) explain the mode of action of a P-N junction;	i) The teacher to guide students through question and answer technique to explain the mode of action of a P-N junction. ii) Students to explain the mode of action of a P-N junction.	i) Diodes ii) Two dry cells iii) Bulb iv) Connecting wires	Is the student able to identify the types of diode?	
	c) identify the types of diodes; and	i) The teacher to display different types of diodes ii) Students to identify types of diodes.	i) Different types of diodes ii) Light emitting diode (LED).	Is the student able to identify the types of diode?	

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	d) construct a half- wave and full- wave rectifier.	i) The teacher to guide students to discuss a circuit which shows half and full- wave rectifications. ii) Students to construct circuits which show half-wave and full-wave rectifications.	i) D.C source ii) Diodes iii) Capacitor iv) Resistors v) Connecting wires vi) CRO vii) Signal generator viii) Bulb	Is the student able to construct a half-wave and full- wave rectifier?	
5.3 Transistor	The student should be able to: a) describe the construction of a PNP transistor;	i) The teacher to display transistors and show a diagram of a transistor. ii) Students to describe the construction of a transistor.	i) Chart showing a transistor ii) transistors	Is the student able to describe the construction of PNP junction?	4
	b) explain the mode of action of a PNP transistor;	i) The teacher to display transistors and diagram of a transistor. ii) Students to describe the structure of a transistor.	i) Charts showing a transistor ii) Transistor	Is the student able to explain the mode of action of a PNP transistor?	

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	c) identify the types of transistors; and	i) The teacher to assist students through question and answer technique to identify types of transistors. ii) Students to identify types of transistors.	i) PNP ii) NPN iii) Multmeter with diode test function	Is the student able to identify the types of transistors?	
	d) outline the applications of transistors in daily life.	i) Through question and answer technique the teacher to lead students to outline the applications of transistors. ii) Students to outline the applications of transistors.	i) Radio ii) TV iii) Voltage amplifier	Is the student able to outline the applications of transistors in daily life?	
5.4 Single Stage Amplifier	The student should be able to: a) explain the concept of analogue signals;	i) The teacher to guide students to discuss the concept of analogue signal. ii) Students to explain the concept of analogue signals.	i) Chart showing analogy signal ii) Mobile phone (analogy)	Is the student able to explain the concept of analogue signals?	4
	b) explain the concept of digital signals; and	i) The teacher to assist students to discuss the concept of digital signals ii) Students to explain the concept of digital signals.	i) Chart showing digital signal. ii) Mobile phone (Digital) iii) Watch	Is the student able to explain the concept of digital signals?	

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	c) design a single- stage amplifier.	i) The teacher to guide students to brainstorm on how to design single stage amplifier. ii) Students in groups to design single stage amplifier.	i) Transistors ii) Resistors iii) Oscilloscope iv) Capacitors v) Source of power vi) Microphone vii) Protoboard or connecting wires	Is the student able to design a single stage amplifier?	
6.0 ELEMENTARY ASTRONOMY 6.1 Introduction to Astronomy	The students should be able to: a) explain the concept of astronomy; and	i) The teacher to guide students by using think-pair-share technique to explain the concept of astronomy. ii) Students in small groups to explain the concept of astronomy.	i) Model of universe ii) Chart of universe iii) Clear sky	Is the student able to explain the concept of astronomy?	2
	b) explain the importance of astronomy in everyday life.	i) The teacher to guide students to discuss the importance of astronomy. ii) Students in groups to explain the importance of astronomy in daily life.	i) Clear sky ii) Charts of heavenly bodies	Is the student able to explain the importance of astronomy in daily life?	

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6.2 Solar System	The student should be able to: a) distinguish between a star and a planet; and	i) The teacher to guide students through question and answer technique to distinguish between star and planet. ii) Students in groups to give the difference between a star and planet.	i) Venus star ii) Chart of the solar system iii) Binoculars	Is the student able to distinguish between a star and planet?	2
	b) explain the force of gravitation which maintains celestrial bodies in their orbits.	i) The teacher to lead students to do a library search on the concept of force of gravitation which maintains bodies in their orbits. ii) Students in group to explain the force of gravitation which maintains bodies in their orbits.	i) Earth and moon ii) Two bodies iii) Chart of Earth	Is the student able to explain the force of gravitation which maintains celestrial bodies in their orbits?	
6.3 Constellations	The student should be able to: a) explain the concept of constellation;	i) The teacher to guide students to brainstorm the concept of constellation. ii) Students to explain the concept of constellation.	Chart of different constellations.	Is the student able to explain the concept of constellation?	2
	b) identify constellations; and	i) The teacher to guide students through question and answer technique to identify kinds of constellations. ii) Students to identify and name common constellations.	Chart of different constellations.	Is the student able to identify constellations?	

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	c) uses of constellations in everyday life.	i) The teacher and students to discuss the uses of constellations in navigation and season's prediction. ii) Students to explain the uses of constellations in everyday life.	Chart showing seasons.	Is the student able to use constellations in everyday life?	
6.4 The Earth and the Moon	The student should be able to: a) describe the surface features and temperature of the moon; and	i) The teacher to guide students by using Thin-Pair-Share technique to describe the surface features and temperature of the moon. ii) Students to describe the surface features of the moon.	i) Model of the moon ii) Chart of the moon.	Is the student able to describe the surface features and temperature of the moon?	2
	b) explain the causes of ocean tides.	i) The teacher to guide students through question and answer technique to explain the causes of ocean tides. ii) The teacher to plan for study visit along the coast of lake or sea for observation on the effects of water tides.	i) Chart of ocean tides ii) Model of Earth global.	Is the student able to explain the causes of ocean tides?	

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7.0 GEOPHYSICS 7.1 Structure and Composition of the Earth	The student should be able to: a) describe the structure of the earth;	i) The teacher to guide students to discuss the structure of the earth. ii) Students to describe the structure of the earth.	i) Chart of structure of the earth. ii) Model of Earth Structure	Is the student able to describe the structures of the earth?	2
	b) describe the composition of the layers of the earth; and	i) The teacher to guide students to brainstorm the composition of the layers of the earth. ii) Students in groups to describe the composition of the layers of the earth.	Chart of structure of the earth.	Is the student able to describe the composition of the layers of the earth?	
	c) explain the importance of the layers of the earth.	i) The teacher to guide students through question and answer technique to explain the importance of the layers of the earth. ii) Students in groups to explain the importance of the layers of the earth.	i) Chart of structure of the earth. ii) Minerals	Is the student able to explain the importance of the layers of the earth?	
7.2 Earthquakes and Volcanoes	The student should be able to: a) explain the origin of volcanoes;	i) The teacher to guide students to brainstorm the origin of volcanoes; ii) Students to explain the origin of volcanoes.	Charts of volcanoes.	Is the student able to explain the origin of volcanoes?	4

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	b) describe effects of volcanoes;	i) The teacher to guide the students through question and answer technique to describe the effects of volcanoes. ii) Students to describe the effects of volcanoes.	Pictures showing effect of volcano.	Is the student able to describe the effects of volcano?	
	c) explain the origin of earthquake; and	i) The teacher to guide students to brainstorm the concept of the earthquake. ii) Students in groups to explain the origin of earthquakes.	i) Chart of earth quake ii) Picture of earthquake.	Is the student able to explain the origin of earthquakes?	
	d) describe the principle of measurement of earthquake; and	i) The teacher to guide students by using Think-Pair-Share technique to describe the principle of measurement of earthquakes. ii) Students to discuss in groups how to record the measurement of earthquake.	i) Seismometer chart ii) Seismometer.	Is the student able to describe the principle of measurement of earthquake?	
	e) identify precautions against earthquake hazards.	i) The teacher to assist students to brainstorm the hazards precautions against earthquake hazards. ii) Students in group to identify the precautions against earthquake and hazards.	Meteorology report	Is the student able to identify precautions against earthquake hazards?	

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7.3 Structure and Composition of the Atmosphere	The student should be able to: a) describe the vertical structure of the atmosphere; and	i) The teacher to lead students through question and answer technique to describe the vertical structure of the atmosphere. ii) Students to describe the vertical structure of the atmosphere.	Chart of structure of Earth's atmosphere.	Is the student able to describe the vertical structure of the atmosphere?	4
	b) describe the composition of the atmosphere.	i) The teacher to guide students to brainstorm the compositions of the atmosphere. ii) Students by using think-pair-share technique to describe the composition of atmosphere.	Chart of structure of atmosphere showing the layers.	Is the student able to describe the composition of the atmosphere?	
	c) explain the importance of various layers of the atmosphere.	i) The teacher to guide students to do a library search on the importance of various layers of the atmosphere. ii) Students to explain the importance of various layers of the atmosphere	i) Chart of structure of atmosphere showing the layer. ii) Communication system	Is the student able to explain the importance of various layers of the atmosphere?	

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7.4 The Greenhouse Effect and Global Warming	The student should be able to: a) explain the greenhouse effect;	i) The teacher to guide the students to brainstorm the greenhouse effect ii) Students in groups to explain the greenhouse effect.	i) Chart of greenhouse ii) Chart of ozone layer.	Is the student able to explain the greenhouse effect?	4
	b) identify sources of greenhouse;	i) The teacher to lead students through Think-Pair-Share technique to identify sources of green house. ii) Students to identify sources of green house.	Greenhouse gases.	Is the student able to identify sources of green house?	
	c) explain the occurrence of global warming; and	i) The teacher to assist students through question and answer technique to explain the occurrence of global warming. ii) Students in groups to explain the occurrence of global warming.	Chart of effect of global warning.	Is the student able to explain the occurrence of global warming?	
	d) state the consequences of global warming.	i) The teacher to guide students to brainstorm the consequences of global warming. ii) Students to state the consequences of global warming.	i) Picture of effect of global warming ii) Melting ice caps.	Is the student able to state the consequences of global warming?	