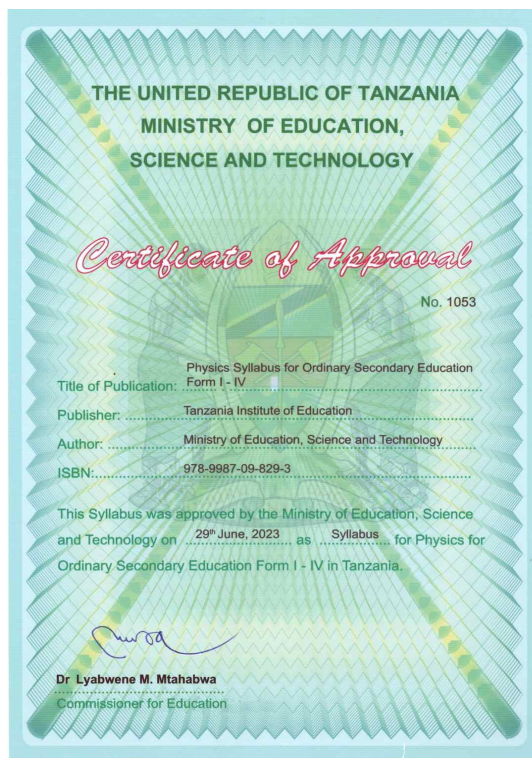


**THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY**



**PHYSICS SYLLABUS FOR ORDINARY SECONDARY EDUCATION
FORM I-IV
2023**

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Tanzania Institute of Education
P.O. Box 35094
Dar es Salaam, Tanzania

Tel. +255 735 041 168 / 735 041 170
E-mail: director.general@tie.go.tz
Website: www.tie.go.tz

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Abbreviations and Acronyms

ICT	Information Computer Technology
TIE	Tanzania Institute of Education
PhET	Physics Education Technology

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Dr Aneth A. Komba

Director General

Tanzania Institute of Education

1.0 Introduction

Physics is a compulsory subject for Form I–IV students in General Education pathway who choose to join the Science, Agriculture or ICT streams at Ordinary Secondary Education. However, it is an elective subject to other streams. The purpose of learning Physics is to provide students with a contemporary and coherent understanding of matter, energy and their interrelations by focusing on investigating natural phenomena and then applying concepts, theories, principles, and laws to explain the physical behaviour of the universe. Furthermore, the subject aims to promote students with scientific skills and other skills related to critical thinking, creativity and innovation, communication and collaboration. It also serves as a bridge to enable students appreciate the values of resources present in Tanzania and develop the ability to create works for self-employment.

This syllabus is designed to guide the teaching and learning of Physics for Ordinary Secondary Education Form I–IV in the United Republic of Tanzania. The syllabus interprets the competences indicated in the 2023 Ordinary Secondary Education Curriculum. It provides information that will enable teachers to plan their teaching process effectively. It also provides teaching and learning opportunities that guide teachers to apply different methods and strategies to promote students’ scientific and ICT skills and develop 21st century skills which include critical thinking, creativity, communication, collaboration and problem solving.

2.0 Main Objectives of Education in Tanzania

The main objectives of education in Tanzania are to enable every Tanzanian to:

- (a) Develop and improve his or her personality so that he or she values himself or herself and develops self-confidence;
- (b) Respect the culture, traditions and customs of Tanzania; cultural differences; dignity; human rights; attitudes and inclusive actions;

- (c) Advance knowledge and apply science and technology, creativity, critical thinking, innovation, cooperation, communication and positive attitudes for his or her own development and the sustainable development of the nation and the world at large;
- (d) Understand and protect national values, including dignity, patriotism, integrity, unity, transparency, honesty, accountability and the national language;
- (e) Develop life and work-related skills to increase efficiency in everyday life;
- (f) Develop a habit of loving and valuing work to increase productivity and efficiency in production and service provision;
- (g) Identify and consider cross-cutting issues, including the health and well-being of the society, gender equality, as well as the management and sustainable conservation of the environment; and
- (h) Develop national and international cooperation, peace and justice per the constitution of the United Republic of Tanzania and international conventions.

3.0 Objectives of Ordinary Secondary Education

The objectives of Ordinary Secondary Education-General Education are to:

- (a) Strengthen, broaden and develop a deeper understanding of the knowledge, skills and attitudes developed at the Primary Education;
- (b) Safeguard customs and traditions, national unity, national values, democracy, respect for human and civil rights, duties and responsibilities associated with such rights;
- (c) Develop self-confidence and the ability to learn in various fields, including science and technology as well as theoretical and technical knowledge;

- (d) Improve communication using Tanzanian Sign Language (TSL), tactile communication, Kiswahili and English. The student should be encouraged to develop competence in at least one other foreign language, depending on the school situation;
- (e) Strengthen accountability for cross-cutting social issues, including health, security, gender equality and sustainable environmental conservation;
- (f) Develop competence and various skills which will enable the student to employ himself or herself, to be employed and to manage his or her life by exploiting his or her environment well; and
- (g) Develop readiness to continue to Advanced secondary and tertiary education.

4.0 General Competences for Ordinary Secondary Education

The general competences Ordinary Secondary Education are to:

- (a) Use the knowledge and skills developed in Primary Education to strengthen and expand academic understanding;
- (b) Value citizenship and national customs;
- (c) Demonstrate confidence in learning various professions, including Science and Technology, theoretical and technical knowledge;
- (d) Use language skills, including Tanzania Sign Language (TSL), Kiswahili language, English and at least one other foreign language to communicate;
- (e) Use knowledge of cross-cutting issues to manage his or her environment around them; and
- (f) Use knowledge and skills to enable him or her to be self-employed, employable; and manage life and environment.

5.0 Main and Specific Competences

The main and specific competences to be developed are presented in Table 1.

Table 1: *Main and Specific Competences for Form I-IV*

Main competences	Specific competences
1.0 Apply knowledge of Physics in various contexts	1.1 Demonstrate mastery of basic concepts, theories and principles of Physics 1.2 Demonstrate mastery of basic terminologies, measurements and symbols in Physics 1.3 Use mathematics to explain physical principles and phenomena
2.0 Conduct experiments in Physics	2.1 Demonstrate mastery of basic experimental skills in Physics 2.2 Demonstrate mastery of data analysis, presentation and report writing in Physics
3.0 Evaluate and use information in Physics	3.1 Collect, describe and relate physical data 3.2 Carry out a project in Physics

6.0 Roles of Teachers, Students, and Parents in Teaching and Learning Process

A good relationship between a teacher, student and parent or guardian is fundamental in ensuring essential learning. This section outlines the roles of each participant in facilitating effective teaching and learning of Islamic Knowledge.

6.1 The teacher

The teacher is expected to:

- (a) Help the student to learn and acquire the intended competences in Physics;
- (b) Use teaching and learning approaches that will allow students with different needs and abilities:
 - (i) Develop the competences needed in the 21st century;
 - (ii) Actively participate in the teaching and learning process.
- (c) Use student centred instructional strategies that make the student a centre of learning which allow them to think, reflect and search for information from various sources.
- (d) Create a friendly teaching and learning environment;
- (e) Prepare and improvise teaching and learning resources.
- (f) Conduct formative assessment regularly by using tools and methods which assess theory and practice.
- (g) Treat all the students equally irrespective of their differences;
- (h) Protect the student while at school;
- (i) Keep track of the student's daily progress;
- (j) Identify the student's needs and provide the right intervention;
- (k) Involve parents/guardians and the society at large in the student's learning process; and
- (l) Integrate cross-cutting issues and ICT in the teaching and learning process.

6.2 The student

The student is expected to:

- (a) Develop the intended competencies by participating actively in various activities inside and outside the classroom; and
- (b) Participate in the search for knowledge from various sources, including textbooks, reference books and other publications in online libraries.

6.3 The parent

The parent / guardian is expected to:

- (a) Monitor the child's academic progress in school;
- (b) Where possible, provide the child with the needed academic support;
- (c) Provide the child with a safe and friendly home environment which is conducive for learning;
- (d) Keep track of the child's progress in behaviour;
- (e) Provide the child any necessary materials required in the learning process; and
- (f) Instil in the child a sense of commitment and positive value towards education and work.

7.0 Teaching and Learning Methods

The teaching and learning methods are instrumental in developing student's competences. This syllabus suggests teaching and learning methods for each activity which includes but not limited to discussions, presentations, field visits, practical work, research, scientific experiments, and project works. However, a teacher is advised to plan and use other appropriate methods based on the environment or context. All the teaching and learning methods should be integrated with the everyday lives of students.

8.0 Teaching and Learning Resources

The process of teaching and learning requires different resources. In that regard, both the teacher and students should work together to collect or improvise alternative resources available in the school and home environment when needed. The teacher is expected to constantly seek for information from various sources to effectively facilitate teaching and learning. The list of approved textbooks and reference books shall be provided by the TIE.

9.0 Assessment

Assessment is important in teaching and learning of Physics subject. It is divided into formative and summative assessments. Formative assessment informs both the teacher and students on the progress of teaching and learning, and in making decisions on improving the teaching and learning process. Teachers are, therefore, expected to apply a wide range of formative assessment methods which include but not limited to discussions, presentations, oral questions, experiments, observations, practical and projects.

Summative assessment, on the other hand, will focus on determining student's achievement of learning. Teachers are expected to use a variety of summative assessments including mid-term tests, terminal, mock examinations and projects. The scores obtained from these assessments will be used as Continuous Assessment (CA). Therefore, the continuous assessments shall contribute 30% and the National Form IV Examination shall be 70% of the student's final achievement, as indicated in Table 2.

Table 2: *Contribution of Continuous Assessment and National Examination in the final score*

Assessment measures	Weight (%)
Standard VI National Assessment	7.5
Form II National Assessment	7.5
Form III Final Assessment	5
Form III Project	5
Form IV Mock Examination	5
Form IV National Examination	70
Total	100

10.0 Number of Periods

The Physics Syllabus for Ordinary Secondary Education provides estimates of the time that will be spent in teaching and learning taking into consideration of the complexity of the specific competences and the learning activities. Therefore, three periods per week for Form I-II and four periods per week for Form III-IV of 40 minutes have been allocated for this subject.

11.0 Teaching and Learning Contents

The contents of this syllabus are presented in matrix form with seven columns which include Main competences, specific competences, learning activities, suggested methods, assessment criteria, suggested resources, and number of periods as presented in Table 3-6.

Form I

Table 3: Detailed Contents for Form I

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Apply knowledge of Physics in various contexts	1.1 Demonstrate mastery of basic concepts, theories and principles of Physics	(a) Explain the concept of Physics (<i>Meaning, branches and connection with other disciplines</i>)	<p>Brainstorming: Guide students to brainstorm different physical phenomena (natural and man-made) in their environment in relation to Physics</p> <p>Group discussion: Guide students in manageable groups through the use of ICT to come up with the meaning and branches of Physics</p> <p>Field trip: Organise field trips to help students to explore the applications of Physics in real life experience</p>	Concept of Physics is clearly explained	Online resources, multimedia sources	22

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Discuss the contribution of Physics to the development of modern society	<p>Brainstorming: Guide students to brainstorm on the contributions of Physics in the development of modern society</p> <p>ICT-based learning: Guide the students through different Online sources and web-based information to explore contributions of Physics in the development of modern society</p>	Contributions of Physics to the development of modern society are clearly discussed	Balls, conical pendulum, banked road, whirling water in bucket, telescope, solid object, Earth globe, calipers or rulers, jug, F1-10 hydraulics bench and stopwatch	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Explain concepts of physical quantities (fundamental and derived quantities) and their, SI units	<p>Brainstorming: Guide students to brainstorm on measurable objects found in their environment</p> <p>Jigsaw: Guide students through Jigsaw method to measure the size of various objects assign the SI Unit of the measured quantities</p>	The concepts of physical quantities are clearly explained	Tape measure, vernier caliper, stopwatch, protractor, beam balance, magnetic compass and force gauge	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Describe concepts of linear motion (<i>speed, velocity, acceleration, distance, and displacement</i>)	<p>Circle the sage: Guide students through circle-the-sage to explore the concept of linear motion</p> <p>Questions and answers: Facilitate the students through questions and answers on the real-life applications of linear motion</p> <p>ICT based learning: Guide students through the use of interactive simulations to visualize the concept of linear motion</p>	The concepts of linear motion are clearly described	String, bob, fixed point, smooth table surface, single pulley, springs, masses and online resources	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(e) Explain the concepts and principles related to force, density, pressure, work, power, energy	<p>Brainstorming: Guide students to brainstorm on the concepts and principles related to force, density, pressure work, power and energy</p> <p>ICT based learning: Guide students through the use of interactive simulations to visualize the concepts and principles related to force, density, pressure, work, power, energy</p> <p>Questions and answers: Use questions and answers to guide students explaining the principle related to force, density, pressure, power and energy</p>	The concepts and principles related to force, density, pressure, work, power and energy are explained clearly	Water tank, basin, different liquids, different solid materials, worksheet, online resources, spring balance and video	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(f) Deduce the relationship between density, sinking and floating	<p>Experimentation: Guide the students to perform an experiment to deduce the relationship between density, sinking and floating</p> <p>ICT-based learning: Guide student through the use of different online sources and web-based information to explore principles related to density, sinking and floating</p>	The relationship between density, sinking and floating is correctly deduced	Water tank, sinking objects, worksheets, stone, dry wood, picture of floating and sinking objects and online resources	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(g) Describe the mechanical properties of matter in relation to force and energy	<p>Think-ink pair share: Guide the students through Think ink pair share to explore the mechanical properties of matter in relation to force and energy</p> <p>Group discussion: Organize students in manageable groups to discuss different terms related to mechanical properties of matter</p> <p>Experimentation: Guide the students through experiment to investigate the relationship between various mechanical properties of matter</p>	The concepts and principles related to force, density, pressure, power and energy are explained clearly	Metal rod, wooden rod, spring and masses, liquid (water), different shapes and sizes container, glass jar with cork and rubber band	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	1.2 Demonstrate mastery of basic terminologies, measurements and symbols in Physics	(a) Describe various instruments used for measurement in Physics	<p>Circle-the-sage: Guide students through circle-the-sage strategy to describe various instruments used for measurements in Physics</p> <p>Project work: Facilitate the students to describe various instruments used in Physics measurement</p> <p>Virtual lab experiment: Facilitate the students through the use of Virtual lab to perform experiments to measure various objects</p>	Measuring instruments used in Physics measurements are correctly described	Online resources, flow-tube, thermometers, stopwatch, retort stand, vernier calliper and steel balls of varying diameters	11

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Relate measuring instruments to physical quantities	Practical work and experimentation: Guide the students through practical work and experiment to measure different physical quantities by using appropriate instruments	Precision and accuracy of measurements are clearly related	Data and online resources	
	1.3 Use mathematics to explain physical principles and phenomena	(a) Use mathematical knowledge to describe relationship between various physical quantities (<i>force, velocity, acceleration, density, pressure</i>)	Group discussion: Organize students in manageable groups through the use of mathematical knowledge to describe the relationship between various physical quantities Problem solving: Guide the students to use physical principles to solve real life problems	The mathematical knowledge is used to describe the relationship between various physical quantities	Online resources and Physics reference books	14

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Conduct experiments in Physics	2.1 Demonstrate mastery of basic experimental skills in Physics	(a) Conduct experiments related to linear motion, density, force, pressure, work, energy, power and mechanical properties of matter	<p>Experimentation: Guide students through experiments to investigate the relationship between various parameters related to linear motion, density, force, pressure, work, energy, power and mechanical properties of matter</p> <p>ICT based learning: Facilitate the students through the use of virtual lab, to investigate the principles related to linear motion, density, force, pressure, work, energy, power and mechanical properties of matter</p>	Experiments are properly conducted following the scientific method	Online resources, Small masses, meter rule, stop watch, trolley model calipers, wooden and metal rods, balances, string and pulley	16

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Demonstrate mastery of data analysis, presentation and report writing in Physics	(a) Explain the methods of analysing experimental data in physics (statistical analysis)	<p>Group discussion: Guide students in groups to investigate various methods used to analyse experimental data in physics (statistical analysis)</p> <p>ICT based approach: Guide students through the use of ICT to investigate the best methods for analysing experimental data in Physics (statistical analysis)</p>	The methods of analysing experimental data are explained correctly	Data and Online resources, Physics reference books	15

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Use analytical methods to manipulate experimental data in physics	<p>Brainstorming: Facilitate the students to brainstorm on the analytical methods used to manipulate experimental data in physics</p> <p>ICT based approach: Guide students in utilizing interactive digital simulations to explore the hands-on activities for analytical methods to manipulate experimental data in physics</p>	Analytical methods to manipulate experimental data in physics are correctly performed	Data and Online resources, Physics reference books	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Use graphical method to present experimental results in physics	<p>Group discussion: Facilitate students through the use of graphical method to present experimental results in physics</p> <p>Use of ICT facility: Guide students in utilizing interactive digital simulations and other software to present the experimental results using graphs</p>	The graphical method to present experimental results in physics is clearly used	Data and online resources, Physics reference books and different graph papers	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
3.0 Evaluate and use information in Physics	3.1 Collect, describe and relate physical data	(a) Collect and analyse data to explain various physical quantities (<i>density, force, pressure</i>)	<p>Cooperative learning strategy: Guide students to share their understanding on how to collect and analyse data to explain various physical parameters (density, force, pressure)</p> <p>Project work: Facilitate students to do projects to collect, analyse data and explain various physical parameters (density, force, pressure)</p>	The data used to explain various physical parameters are collected and analysed appropriately	Text books and Online resources	15

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Collect and analyse data to explain experimental observations related to linear motion, force, density, pressure and mechanical properties of matter	<p>ICT based approach: Guide students in utilizing interactive digital simulations to collect analyse data and explain experimental observations related to linear motion, force, density, pressure and mechanical properties of matter</p> <p>Experimentation: Guide students in manageable groups to conduct experiments and analyse collected data</p>	The physical data to explain experimental observations related to given concepts are appropriately collected and analysed	Online resources	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	3.2 Carry out a project in Physics	(a) Develop prototype devices based on the concepts, theories, principles and laws gained from the field of linear motion, force, density, pressure and mechanical properties of matter	<p>Group discussion: Organize students in manageable groups to discuss the procedure for the development of prototype devices based on the concepts, theories, principles and laws gained from the field of linear motion, force, density, pressure and mechanical properties of matter</p> <p>Problem based approach: Guide students to relate the designed prototypes and real life.</p>	Prototypes are developed based on Physics		16

Form II

Table 4: Detailed Contents for Form II

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Apply knowledge of Physics in various contexts	1.1 Demonstrate mastery of basic concepts, theories and principles of Physics	(a) Describe the concept and principles of light (<i>sources of light, propagation and transmission, image formation, colours, optical instruments</i>)	<p>Brainstorming: Guide students to brainstorm on the concepts and principles of light (sources of light, propagation and transmission, image formation, colours, optical instruments)</p> <p>Group discussion: Guide students in manageable groups to explore the concepts and principles of light</p> <p>Field trip: Organise field trips help students to explore applications of light</p>	The concepts and principles of light are described correctly	Torch, candle, cardboard with slit, light emitting diodes and fluorescent tube	30

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Describe the concept and principles of magnetism (<i>magnetization and demagnetization, magnetic fields</i>)	<p>Group discussion: Guide students to discuss the concepts and principles of magnetism through hands-on activities</p> <p>ICT based learning: Guide the students through the use of interactive simulations and animations to visualise magnetic field patterns</p> <p>Project work: Guide students in groups to work on different projects on magnetization and demagnetization of different materials</p>	The concepts and principles of magnetism are described correctly	Different types of magnets, iron fillings, card board, connecting wires and batteries	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Explain the concept and principles of static electricity (<i>detection of static charges, types of materials, capacitors, charge distributions and lightning conductor</i>)	<p>Practical Work and Experiment: Guide learners to explore the concepts and principles of static electricity through hands-on activities.</p> <p>Interactive simulations Facilitate students to visualize and understand the concepts and principles of static electricity</p> <p>Brainstorming: Guide students to explore the application of static electricity in their environment</p>	The concepts and principles of static electricity are clearly explained	Small pieces of paper, plastic comb, polythene rod, capacitor and lighting conductor, rod and wires	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Describe the concept and laws of current electricity (<i>electromotive force, potential difference, resistance, effect of electric current, domestic electrical installation</i>)	<p>Group discussion: Guide students in groups to discuss the concept of current electricity</p> <p>Hands-on activity: Guide learners to explore the concept and laws of current electricity through hands-on activities.</p> <p>Interactive simulations: Facilitate students to visualize the flow of charges</p>	The concept and laws of current electricity are described correctly	Ammeter, Voltmeter, switch. Meter bridge, resistors, connecting wire and batteries	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	1.2 Use mathematics to explain physical principles and phenomena	(a) Apply mathematical knowledge to describe various relations related to light and current electricity	<p>Group discussion: Guide students through manageable groups to apply mathematical knowledge to describe various relations related to light and current electricity</p> <p>Think ink pair share: Guide students through think ink pair share to apply mathematical knowledge to describe various relations related to light and current electricity</p> <p>Problem based learning: Guide students to relate the principles related to light and current electricity with real-life situation.</p>	Mathematical knowledge is applied correctly to describe various relations related to light and current electricity	Text books	9

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Conduct experiments in Physics	2.1 Demonstrate mastery of basic experimental skills in Physics	(a) Carry out experiments related to light, magnetism, static electricity and current electricity	<p>Practical works: Guide students through hands-on activities to investigate relationship between different parameters related to light, magnetism, static electricity and current electricity</p> <p>ICT based approach: Guide students through interactive simulations to visualize and carry out experiments related to light, magnetism, static electricity, and current electricity</p>	Experiments related to light, magnetism, static electricity and current electricity are carried out correctly	<p>Ammeter, Voltmeter, switch. Meter bridge, resistor, connecting wire,</p> <p>Torch, card board with slits, triangular prism, plane mirrors and curved mirrors</p>	20

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Demonstrate mastery of data analysis, presentation and report writing in Physics	(a) Use spreadsheet to process experimental data in physics	<p>ICT based approach: Guide students through the use of ICT-programs such as spreadsheet to process experimental data in Physics</p> <p>Experimentation: Guide students through experiments to deduce the relationship between various parameters related to light, magnetism, static electricity and current electricity</p>	Experimental data are correctly processed using various spread sheet programs		28

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Use graphs to analyse and determine mathematical relationships between various variables in Physics	<p>ICT based approach: Guide students through interactive simulations to collect and analyse the experimental data using graphs and use the graphs to establish the mathematical relationships between various variables in Physics</p> <p>Group discussion: Facilitate the students through manageable groups to discuss the use of graphs to analyse the experimental data and use it to establish the relationship between the variables in Physics</p>	The graphs are used appropriately to analyse and determine mathematical relationships between various variables in Physics	Online resources, graph paper, protractor, ruler, manila, chart other resources	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Communicate experimental results orally	<p>Cooperative learning: Guide students to work in pairs or small groups to analyse and interpret graphs</p> <p>Problem-based learning: Guide students with real-world problems that require them to analyse and interpret graphs to determine the mathematical relationship between variables</p> <p>Guided practice approach: Facilitate students with guided practice in analysing and interpreting graphs</p>	The experimental results are communicate orally correctly	Varios graphs based on experimental data and Online resources	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
3.0 Evaluate and use information in Physics	3.1 Collect, describe and relate physical data	(a) Collect and analyse data to explain various physical quantities (<i>light, magnetism, static electricity and current electricity</i>)	<p>Problem-solving approach: Guide students with real-world problems that require them to analyse collected physics data to explain various physical quantities</p> <p>Collaborative learning: Guide the students to work in pairs or small groups to analyse and interpret collected Physics data</p> <p>ICT-based approach: Guide students through the use of technology such as computer software, online tools, and simulations to analyse and interpret collected data to explain various physical quantities</p>	Collected physics data are correctly analysed to explain various physical quantities	Online resources, other relevant materials	8

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Collect and analyse data to explain experimental observations related to light, magnetism, static electricity and current electricity	<p>Experimentation: Guide students to use electrical equipment and light locally available materials to design experiments to investigate the properties of light, magnetism, static electricity and current electricity</p> <p>ICT-based approach: Guide students through the use of technology such as computer software, online tools, and simulations to analyse and interpret collected data to explain various physical quantities</p>	Collected physics data are correctly analysed to explain experimental observations related to light, magnetism, static electricity and current electricity	Online resources, watch, trolley and model	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	3.2 Carry out a project in Physics	(a) Develop prototype devices based on the concepts, theories, principles, and laws gained from the field of light, magnetism, static electricity and current electricity	<p>Inquiry-based approach: Guide the students to develop prototype devices based on the concepts, theories, principles, and laws gained from the field of light, magnetism, static electricity and current electricity</p> <p>Problem-based approach: Guide the students in discussion to present the way the developed prototypes real world problems related to light and electricity</p>	Appropriate prototype devices are developed based on the concepts, theories, principles, and laws gained from given Physics concepts	Online resources	6

Form III

Table 5: Detailed Content for Form III

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Apply knowledge of Physics in various contexts	1.1 Demonstrate mastery of basic concepts, theories and principles of Physics	(a) Describe the concept of waves and laws of motion (<i>Waves, Newton's laws of motion and linear momentum</i>)	<p>Digital interactive simulations: Facilitate students through interactive simulations to visualize different concepts, theories and laws related to waves and motion</p> <p>Practical Work: Guide students through hands-on activities to explore the concepts of waves and motion</p> <p>Brainstorming: Guide students to brainstorm on the application of the concepts of waves and motion in real life</p>	Concepts of waves and laws of motion are correctly described	Text books, inclined plane and roller Strings, ripple tank, ICT-facilities, stroboscope, tuning forks, pipes, sonometer, resonance tube	30

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Describe the concept and principles of equilibrium (<i>moment of force, centre of gravity and types of equilibrium</i>)	<p>Group discussion: Facilitate students through manageable groups to discuss the concept and principles of equilibrium</p> <p>Practical Work: Facilitate the students through hands-on activities to explore the concept and principles of equilibrium</p>	Concepts and principles of equilibrium are described correctly	Text books, other relevant materials and knife edge	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Explain the concept and laws of friction (<i>types of friction, laws of friction</i>)	<p>Practical work: Provide students with hands-on activities that allow them to explore the concepts and laws of friction</p> <p>Interactive simulations: Guide students through PhET interactive simulations to demonstrate the concept and the laws of friction</p>	Concepts and laws of friction are explained clearly	Wooden block, rough surface, spring balance and standard masses	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Explain the principles of simple machines (<i>lever, pulley, inclined plane, screw jack, wheel and axle, hydraulic press</i>)	<p>Brainstorming: Guide students to brainstorm on different types of simple machines available in their environment</p> <p>Group discussion: Guide students through manageable groups, to discuss the principles of simple machines</p> <p>Practical Work: Provide students with hands-on activities to explore the principles of simple machines</p>	Concepts and principles of simple machines are explained correctly	Pulleys, pair of scissors, wheel barrow, Spade and bottle opener	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	1.3 Use mathematics to explain physical principles and phenomena	(a) Apply mathematical knowledge to describe various principles and physical phenomena related to waves, Newton's laws of motion, equilibrium, friction and simple machines)	Think-ink-pair-share: Facilitate Students through think-ink pair share strategy to apply mathematical knowledge to describe various principles and physical phenomena related to Newton's laws of motion, equilibrium, friction force, simple machines	Mathematical knowledge to describe various principles and physical phenomena are correctly applied	Meter rule, stop watch, spring balance, wooden bar and knife edge	10

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Conduct experiments in Physics	2.1 Demonstrate mastery of basic experimental skills in Physics	(a) Describe types of experimental variables in physics related to motion	Cooperative learning: Facilitate students to work in groups to describe types of experimental variables in Physics	Experimental variables are described clearly	Physics Textbook, Online resources	14
		(b) Carry out scientific investigations related to waves, laws of motion, equilibrium, friction and simple machines	ICT based approach: Guide students in using multimedia resources such as videos, animations, and interactive simulations to carry out scientific investigations related to waves, laws of motion, equilibrium, friction and simple machines	Scientific investigations related to waves, laws of motion, equilibrium, friction and simple machines are carried out	Text books and charts	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Demonstrate mastery of data analysis, presentation and report writing in Physics	(a) Use scientific report to communicate experimental results in Physics	ICT based learning: Guide students the proper use of online resources in presenting the scientific investigation report	A scientific report is correctly used to communicate experimental results in Physics	Charts and online resources	40
3.0 Evaluate and use information in Physics	3.1 Collect, describe and relate physical data	(a) Collect and analyse data to explain various physical parameters (<i>Waves, Newton's laws of motion, equilibrium, friction and simple machines</i>)	Collaborative learning: Guide students to work in pairs or small groups to analyse and interpret collected physics data Multimedia approach: Guide students in utilizing technology such as computer software, online tools, and simulations to analyze collected data explaining various physical quantities	Collected physical data are correctly analysed to explain various physical parameters	Online resources and other relevant materials	30

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Collect and analyse data to explain experimental observations related to Newton's laws of motion, equilibrium, friction and simple machines	<p>Collaborative learning: Guide students to work in pairs or small groups to analyze collected physics data</p> <p>ICT based learning: Guide students through the use of technology such as computer software, online tools, and simulations to analyze collected data explaining various physical quantities</p>	Collected physics data are correctly analysed to explain various physical quantities	Online resources and other relevant materials stop watch and trolley model	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	3.2 Carry out a project in Physics	(a) Develop and carry out a research project in Physics	<p>Group discussion: Guide students through manageable groups to discuss various procedure for carrying out a project</p> <p>Digital interactive simulation: Facilitate students to use virtual labs to analyse the collected data</p> <p>Experimentation: Guide the students using real lab instruments to perform scientific investigations</p>	A research project in Physics is developed and carried out correctly	Online resources and other relevant materials	20

Form IV

Table 6: Detailed Contents for Form IV

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Apply knowledge of Physics in various contexts	1.1 Demonstrate mastery of basic concepts, theories and principles of Physics	(a) Explore the basic tenets of heat (<i>measurement of temperature, thermal expansion, thermal energy, transfer of thermal energy, measurement of thermal energy, vapour and humidity in relation to air temperature</i>)	<p>Brainstorming: Guide students to brainstorm on the concept of heat</p> <p>Experimentation: Guide students in manageable groups to investigate melting and boiling point of different liquids</p> <p>Demonstrations: Guide students to show the expansion of solid and transfer of heat</p> <p>ICT based learning: Guide students to use of interactive simulations on the concept of heat</p>	Concepts of heat are explored appropriately	Thermometer, calorimeter, ball and ring, heat source, metal rods and hygrometer	40

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Explore the basic tenets of the physics of the atom (<i>structure of atom and structure nuclear, radioactivity, nuclear radiations, nuclear processes and thermionic emission</i>)	<p>Brainstorming: Guide students to brainstorm on the concepts of nuclear physics, radioactivity, nuclear radiation and thermionic emission</p> <p>Field trip: Organized a field trip to the nearby industry/ hospital/ airport for student recognize the application of nuclear physics</p> <p>ICT-based learning: Use different Online sources to guide students to analyse concepts related to the physics of the atom</p>	The concepts and principles related to the Physics of the atom are explored appropriately	GM counter, Periodic Table and chart showing radioactive elements	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(c) Describe the basic principles of electronics (<i>semiconductors, diode, transistor, amplifier</i>)	<p>Brainstorming: Guide students to brainstorm on electronic components in their environment</p> <p>Scenario: Organise students in manageable groups and provide a scenario for them to investigate the conduction of different materials</p> <p>ICT based learning: Guide students with the help of ICT to visualize various electronic components and their functions</p> <p>Experiment: Guide students in manageable groups to investigate the conduction of a semiconductor diode</p>	The concepts of electronics are described correctly	Periodic Table, online resources, Text books, CRO, Diode, Transistor, AC Voltage Generator and connecting wires	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(d) Describe the concept of renewable energy <i>(solar, hydropower, wind and geothermal energy)</i>	<p>Brainstorming: Guide students to brainstorm on the concepts of renewable energy</p> <p>Group discussion: Organize students in manageable groups to discuss various forms of renewable energy</p> <p>ICT-based learning: Guide students through interactive simulations to explore the concept of renewable energy</p>	The concepts of renewable energy are described appropriately	Solar panel, online resources, Charts, wind mill model, batteries, connecting wires and inverters	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	1.2 Use mathematics to explain physical principles and phenomena	(a) Apply mathematical knowledge to describe various principles and physical phenomena related to heat, physics of the atom, electronics and renewable energy	<p>Group discussion: Facilitate students in groups to apply mathematical knowledge to describe various principles and physical phenomena related to heat, physics of the atom, electronics and renewable energy</p> <p>Problem based learning: Guide students to identify problems related to heat, physics of the atom electronics and renewable energy, and facilitate them to use mathematical knowledge or identified mathematical formula to find the solutions of identified problems</p>	Mathematical knowledge to describe various principles and physical phenomena are correctly applied	Online resources and textbooks	16

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
2.0 Conduct experiments in Physics	2.1 Demonstrate mastery of basic experimental skills in Physics	(a) Carry out scientific investigations related to heat, physics of the atom, electronics and renewable energy	<p>ICT based learning: Use different Online sources to guide students to conduct the scientific investigations on the application of various instruments in electronics, renewable and to investigate the physics of the atom and heat</p> <p>Practical work: Guide the learners through step-wise procedure to use practical work to carried out scientific investigations</p>	Scientific investigations related to heat, physics of the atom, electronics and renewable energy are analysed appropriately	Thermometer, calorimeter, online resources (Simulation) and GM counter	20

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Demonstrate mastery of data analysis, presentation and report writing in Physics	(a) Use scientific report to communicate experimental results in Physics	Cooperative learning: Guide students in the proper use of online resources in presenting a scientific investigation report to communicate experimental results	A scientific report is correctly used to communicate experimental results in Physics	Charts and online resources	10
3.0 Evaluate and use information in Physics	3.1 Collect, describe and relate physical data	(a) Collect and analyse data to explain various physical parameters (<i>heat, physics of atom, electronics and renewable energy</i>)	ICT based learning: Use different online sources (virtual lab) and web-based information to guide students to explore different methods of data collection in physics experiments	Collected physics data are correctly analysed to explain various physical quantities	Online resources	30

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Collect and analyse data to explain experimental observations related to heat, physics of atom, electronics and renewable energy	<p>Group discussion: Guide students in groups to discuss various methods of data collections</p> <p>Project work: Guide students to conduct mini research work and facilitate them to collect and organize data from the research work</p> <p>ICT-based learning: Use different online sources and web-based information to guide students to visualize and explore different scenarios from variety of sources and present their observations</p>	Collected physical data are correctly analysed to explain experimental observations related to heat, physics of atom, electronics and renewable energy	Online resources and other relevant materials	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	3.2 Carry out a project in Physics	(a) Complete and submit a report for the research project started in Form III	<p>Problem-solving approach: Guide students with real-world problems that require them to analyze collected physics data to explain various physical parameters</p> <p>Collaborative Learning: Guide the students to work in pairs or small groups to analyze and interpret collected physics data</p> <p>ICT-based learning: Use different online sources and web-based information to guide to complete and submit project report</p>	Report for the research project started in Form III is completed and submitted	Online resources	24

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