**REPUBLIC OF RWANDA CLASS & COMBINATION: S4…..**

**MINEDUC CLASS SIZE……..**

**GASABO DISTRICT**

**SCHOOL NAME:……………… NUMBER OF PERIOD PER WEEK:7**

**TEACHER’S NAMES………………………………………**

***PHYSICS - SCHEME OF WORK / UNIT PLAN 2022-2023 ACADEMIC YEAR***

***1st TERM,2022-2023***

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| Time | Topic, sub topic area and unit | Lesson title+ Evaluation | Learning activities and links to other subjects | References and pedagogical materials | Observation |
| **4 weeks**  **26/10-21/11/2022**  **28periods** | Topic**:**  **Light**  Unit:  ***Thin lens*** | * Characteristics of lenses. * Types of lenses. * Refraction of light through lenses. * Ray drawing and properties of images formed by lenses for an object located at different positions. * Graphical determination of focal length of lenses. * Thin lens equation.   .   * Lens combination. * Derivation of lenses formulae * Defects and correction of lenses. * Applications of combined lenses. * Refraction through prisms * Terms associated with refraction of passing through a prism * Deviation of light rays by a glass prism. * Angle of minimum deviation * Dispersion of light by a prism * Applications of total internal reflection of light by prism * Problem solving related to combined thin lenses and refraction of light. * **General quiz** | * Working in groups   differentiate lenses an  Report.   * Carry out experiment   to determine characteristics of images formed by lenses given positions.   * Establish   experimentally the laws of refraction   * Determine   experimentally the critical angle of a glass block and prism   * Devise and perform   experiment to determine the focal length of a lens.   * Solve problems   involving image position and linear magnification  using lens formulae.   * Search internet to for   details on properties of lenses, image formation  and lens combinations.  **Links to other subjects**: Medicine- Biology (Microscope, ) Astronomy, Photography (camera)   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 24/10-11/11/2022  **3 weeks**  **21 periods** | Topic :  **Light**  Sub-Topic:  ***Optical instruments***  Unit:  **Simple and compound microscope.** | * Definition of an   optical instrument.   * Image formation by   a camera, simple and compound  microscope.   * Magnifying power   of optical instruments.   * Determination of   magnifying power of optical  instruments   * Astronomical   telescope.   * Human eye as   single lens system,   * Defects of vision   and their correction.   * **General quiz** | * Discuss in groups   physical features of optical instruments.   * Determine magnifying   power of optical instruments.   * Make group   presentation on the functioning of simple and compound microscope and  other optical instruments and  write a report.   * Devise a project to   design a compound microscope   * Search internet for   combinations of lenses  **Links to other subjects**: In Astronomy (Telescopes observe distant), Biology and Medicine. (microscope used observe tinny organism)   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 14/11-02/12/2022  **3 weeks**  **21 periods** | Topic:  **Mechanics**  Unit:  **Moments and Equilibrium of bodies** | * Difference between   vector and scalar quantities.   * Force as vector * Moment of a force about a point. * Principles of moment. * Types of equilibrium. * Condition for   equilibrium of a body about an axis.   * Stevinus proof * Forces in equilibrium. * Free –body diagrams. * Couples and Torques, * Equilibrium of Coplanar forces * Archimedes and the principle of the lever. * Equilibrium of moments of force. * Centre of gravity and the total weight centre of gravity of a flat object * Equilibrium of a system of objects (balancing on a seesaw). * **General quiz** | * Discuss the difference vector and scalar quantities. * Devise an experiment to determine the centre of gravity of a lamina. * Carry out an experiment to demonstrate equilibrium of a system of objects. * Search internet to learn about moments of force and equilibrium of a system of bodies   **Links to other subjects**: Mathematics (resolution of vectors).   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 05-09/12/2021  **1 week**  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| 12-16/12/2021  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |
| 19-23/12/2021  **1 week**  **7 periods** | Marking+ reporting | Marking+ reporting | Marking+ reporting |  |  |

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**GASABO DISTRICT**

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TEACHER’S NAMES………………………………………

***2nd TERM ,2022-20223***

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| Time | Topic and sub topic area | Lesson title+ Evaluation | Learning activities and links to other subjects | References and pedagogical materials | Observation |
| 09-27/01/2023  **3 weeks**  **21periods** | Topic:  **Mechanics**  Unit:  **Work, Energy and Power** | * Concepts of Work, Energy and Power. * Mathematical expression of potential energy, kinetic energy, work, and power. * Conservation of mechanical energy. * Work energy theorem. * Strain energy, * Gravitational potential energy * Power and motion * Work done in deforming materials * Collision and impulse. * Conservation of linear   momentum.   * Interactions and collisions. * Solve problems related to energy conservation. * **General quiz** | * Discuss in group the   relationship between  work, energy, and power.   * Observe the impact of   collision between two  moving bodies then  report   * Solve problems   Involving work, energy, power, and conservation of  mechanical energy.   * Solve problems on   Collisions   * Make a group   presentation on  mechanical energy give a  report.  **Links to other subjects:** Chemistry, Astronomy, Civil engineering and Military science.   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 30/01-17/02/2023  **3 weeks**  **21 periods** | Topic:  **Electricity**  Sub-Topic:  **Current electricity**  Unit:  **Kirchhoff’s laws and Electric Circuit** | * Review elements of   simple electric circuit and state the application   * Definition of electromotive force. * Voltage or terminal   potential and electromotive force.   * Sources of electric current   and electric receptors/appliances.   * Internal and external   resistance, potential difference across a cell.   * Connection of electrical   current source and resistors either in series or parallel or mix-up.   * Kirchhoff’s laws (loop   rule and junction rule)   * Application of Kirchhoff’s   laws to simple circuits.   * **General quiz** | * Use a voltmeter to   measure terminal potential difference and compare it with electromotive force.   * Construct a simple   electric circuit consisting of current source (battery) , electric receptors(resistors) and use it to verify Kirchhoff laws.   * Observe electrical   components at home and  school and explain their use   * Search internet to   learn about sources of electric current, electric receptors (resistors) and Kirchhoff ‘laws.   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 20/02-24/02/2023  **1 week**  **7 periods** | Topic:  **Energy, power and climate change**  Sub-Topic:  **Sources of world energy.**  Topic:  **Sources of Energy in the world** | * World energy sources   (fossil fuel, nuclear fuel and renewable sources).   * Extraction and creation   of renewable and nonrenewable energy sources (Fossil and non  fossil fuels, power production),   * Solar energy(photovoltaic   cells and solar heating panels),   * Hydroelectric power, wind   power and wave power. | * Discuss in groups   and present on extraction  and creation of renewable and nonrenewable energy  sources.   * Search internet for   details on world energy resources, extraction and  conservation clean energy resources and level of emission of harmful gases.  **Links to other subjects**: Graphical representation in mathematics, photographic interpretation in Geography , compound formation in  chemistry , Environment and Agriculture. | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 27/02-03/03/2023  **1 week**  **7 periods** | Topic:  **Energy, power and climate change**  Sub-Topic:  **Energy degradation and power generation.**  Unit:  **Energy degradation and power generation** | * Definition of energy   degradation/dilapidation   * Production of electrical   energy by rotating coils in a magnetic fields.   * Conversion of thermal   energy into work by single cyclic processes.   * Energy flow diagrams   illustrating energy degradation.   * **General quiz** | * Discuss in groups   and present on mechanisms of electrical energy production.   * Present as a group   investigation about conversion of thermal energy into work   * Search internet for   Computer simulations illustrating energy flow in a system.  **Links to other subjects:** Flow diagrams in Computer Science,, cyclic processes in Biology, photograph interpretations in Geography.   * **General quiz** |  |  |
| 06-10/03/2023  **1week**  **7periods** | Topic:  **Mechanic**  Sub-topic:  **Dynamic**  Unit:  **Projectile and Uniform Circular motion** | * Definition of projectile   motion and related terms   * Applications of projectile   motion.   * Graphs of projectile   motion.   * Expressions of projectile   Motion (horizontal range and maximum height)   * Definition of key terms in   circular motion: angular displacement, linear and angular velocity, period, frequency, angular and linear acceleration.   * Relationship between   angular and linear parameters.   * Uniform circular motion * Constant acceleration in   circular motion, tangential acceleration.   * Distance time graph of   circular motion.   * Centripetal force. * Application of circular   motion motion.(vertical and horizontal circles, conical pendulum , spinning drier and road banking).   * **General quiz** | * Observe, discuss   and report on parameters in projectile motion.   * Use the equations   of linear motion to determine the horizontal and vertical velocities of a projectile   * Working in groups,   observe circular motion and distinguish between linear and angular quantities.   * Discuss in groups   and make presentation on relationship between angular and linear motion   * Work in groups to   Solve problems in circular motion.   * Search internet   Information on projectile or circular motion and their  applications.  **Links to other subjects:** Physical sports (basketball, football, netball, golf, darts), Military missiles and cannon balls.   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 13-17/03/2023  **2 week**  **14 periods** | Topic:  **Mechanic**  Sub-topic:  **Dynamic**  Unit:  **Universal gravitational field potential** | * Newton's law of universal   gravitation.   * Gravitational field * Universal gravitational   field potential.   * Gravitational potential   Energy   * Relation between universal   gravitational constant and force of  gravity.   * Kepler’s laws. * Problems on gravitational   potential.   * Problems on natural and   artificial satellites.   * **General quiz** | * Solve problems   involving the Law of  universal gravitation   * Solve problems   involving Kepler’s laws   * Use internet search   for history of scientists who contributed to model the universe and make  report   * Use internet to get   information about Kepler’s law.  **Links to other subjects:** Geography and Astronomy (landslides, motion of planets and satellites) Chemistry (electrons orbiting the  nucleus)   * **General quiz** | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 20-24/03/2023  **1 week**  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| 27-31/03/2023  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |

**REPUBLIC OF RWANDA CLASS & COMBINATION: S4….**

**MNEDUC**

**GASABO DISTRICT CLASS SIZE……...**

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**TEACHER’S NAMES………………………………………**

***3rd TERM,2023***

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| Time | Topic and subtopic area | Lesson title+ Evaluation | Learning activities and links to other subjects | References and pedagogical materials | Observation |
| 17/04 -05/05/2023  **3 weeks**  **21 periods** | Topic:  **Motion in field**  Sub-topic:  **Electric field and electric potential**  Unit:  **Effects of electric and potential field** | * Electric charge and   Coulomb's law   * Charge and electric fields   Properties of electric field   * Electric field patterns and   field lines   * Electric field due to a single   electric charge   * Electric field pattern due   to more than one charge(resultant electric field)   * Electric potential * The potential of a point   charge   * Electric Potential Energy * Relation between electric   potential and electric field E=−V/d   * Motion of electric charge in   uniform electric field   * Lightening and lightening   Arrestor   * Problems on uniform   electric field and electric  potential | * Devise and perform an   experiment to illustrate electric fields between two parallel plates   * Solve problems   involving electric field strength and electric potential  Investigate the patterns  of electric field lines and present them in diagrams   * Search internet for   Electric field patterns and their  Combination.  **Links to other subjects:** Chemistry (electrolysis, dye cells) Geography formation of clouds and lightening. | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 08/05-26/05/2023  **3 weeks**  **21 periods** | Topic:  **Heat and thermodynamic**  Sub-topic:  **Thermal effect**  Unit:  **Applications of thermo-dynamics laws** | * Internal energy andtotal energy. * Work done by an expanding gas. * First law of thermodynamics. * Applications of first law: * Isothermal, Isochoric and isobaric processes etc. * Second law of thermodynamics: Adiabatic process, Carnot cycle. * Applications of second   law of thermodynamics: Carnot engine, diesel engine and refrigerator.   * Efficiency of heat   engine.   * Heat engine and climate change | * Work in groups to   differentiate first, second and third laws of thermodynamics.   * Work in groups to   investigate changes in energy and work done for a thermodynamic process and present findings.   * Work in groups to   evaluate change in energy and work done during the Carnot cycle and report   * Solve problems related   to efficiency of a refrigerators   * Work in groups to solve   problems related to heat engine and its efficiency.   * Search internet to new   applications of laws of thermodynamics and present a report  **Links to other subjects:** chemistry ( reactions) | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 29/05-23/06/2023  **4 weeks**  **28 periods** | Topic:  **Astrophysics**  Sub-topic:  **Earth and space**  Unit:  **General Structure of the Solar System** | * Astronomical scales * Sun-Earth-Moon system:   (eclipses, and phases of the moon)   * The Solar system: Inner   planets, outer Planets, comets, meteorites, asteroids   * Kepler's laws. * Star patterns: constellations * Celestial coordinates:   Horizontal system (hour angle, zenith angle); Equatorial system(right ascension, declination) | * Work in groups and   investigate acceleration due to gravity at the earth’s surface and present the results.   * Work in groups to   discuss Kepler’s laws of planetary motion and report   * Work in groups to solve   problems on planetary motion.   * Search for simulations   from the Internet on planetary  motion.  **Links to other subjects:** Geography (climate change and seasons), telecommunication (radio, Global positioning system(GPS),) | Advanced physics by Tom Duncan 9th Edition  S4 student physics book& teacher’s guide |  |
| 26-30/06/2023  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| 03/07-07/07/2022  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |
| 10-14/07/2022  **1 week**  **7 periods** | Marking+ reporting | Marking+ reporting | Marking+ reporting |  |  |