**REPUBLIC OF RWANDA CLASS & COMBINATION: S6…..**

**MINEDUC**

**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 | References and pedagogical materials | Observation |
| 26/10  -21/10/2022  **4 weeks**  **28 periods** | Topic:  **Oscillations and waves**  Sub-Topic:  **Waves.**  Unit:1  **Sound waves** | -Reflection and transmission of waves at boundary of two media.  -Snell’s law and waves.  -Diffraction of waves.  -Principle of superposition of waves.  -Production of sound waves.  -Properties of sound waves  (reflection, refraction,  diffraction and interference)  -Speeds of sound in various  medium  -Characteristics of sound  waves (amplitude, loudness,  frequency, pitch, quality and  overtones, frequency limits of  audibility)  -Resonance, vibrations in  strings and pipes ( frequency  and length pipe)  -Harmonics in strings and pipes  -Sound Intensity  -Doppler’s effect in sound waves  -Solve problems concerning  Doppler’s effect  -  **General quiz** | -Discuss in groups reflection and transmission in two media.  -Perform an experiment to demonstrate diffraction of waves.  -Demonstrate interference using two loudspeakers and signal generator  -Perform an experiment to illustrate propagation of sound wave.  -Solve problems on fundamental frequency of stretched strings  -Devise an experiment to  illustrate Doppler effect and report  -In groups discuss and solve question on Doppler’s effect in sound  waves  -Project work; Work in  groups and report on  Doppler’s Effect observed for moving car sound.  **Links to other subjects**: molecules musical Instruments.   * **General quiz** | Avison, J. (1989). The world of PHYSICS. Cheltenham: Thomas Nelson and Sons Ltd.  S5 physics student book, REB |  |  |
| 24/10  -11/11/2022  **3 weeks**  **21 periods** | Topic:  **Energy, power and climate**  **Change**  Sub-Topic:  **Greenhouse effect**  Unit:2  **Climate change and Greenhouse effect.** | -Definition of climate change and relate facts  -Causes of climate change (Gas emissions)  -Intensity of the sun’s radiation  reaching planets  -Factors determining planet’s  albedo  -Greenhouse effect  -Impact of green house effect on climate change  -Black body radiation, and  emission  -Climate change mitigation  - **General quiz** | -Discus in groups causes of climate change  -Investigate sources of  major greenhouse gases  -Discuss molecular behavior of greenhouse gases in relation to radiation absorption.  -In group discuss and present on the application of energy from greenhouse  effect  -Search internet for information on climate change and greenhouse effect.  **Links to other subjects:** Agronomy, astronomy, Geography (Climate change).   * **General quiz** | Breithaupt, J. (2000). Understanding Physics For Advanced Level. (4 ed.). Ellenborough House, Italy: Stanley Thorners. |  |  |
| 14/11-02/12/2022  **3weeks**  **21 periods** | Topic:  **Energy, power and climate change**  Sub-Topic:  **Agricultural physics**  Unit:3  **Application of Physics in Agriculture** | -Atmosphere constituents.  -Heat and Mass transfer.  -Water vapor in the atmosphere, Variation of atmospheric pressure, air density and water vapor with altitude.  -Physical properties of soil (soil texture and structure).  -Mechanical weathering  (Temperature changes, freezing of water in rocks and  different rates of expansion  and mineral composition soil  erosion and deposition from  water, ice and wind). | -Undertake fieldwork and  make group presentation  on the applications of  physics in Agriculture.  -Discus and in groups physical properties of soil.  -Search internet for application of Physics in  Agriculture.  **Links to other subjects**: Graphs in mathematics, Photograph interpretations in Geography , compounds in Chemistry , Environment in  Agriculture | Chand, S., & S.N., G. S. (2003). Atomic Physics (Modern Physics) (1 ed.). India  CPMD. (2015). Advanced Level Physics Sylabus. Kigali: REB. Cunningham, & William, P. (2000). Environmental science (6 ed.). Mc Graw-Hill. Cutnell, J. D., & Johnson, K. W. (2006). Essentials of Physics. USA: John Wlley &Sons, Inc. Cutnell, J. D., & Johnson, K. W. (2007). Physics. (7 ed.). USA: John Wiley; Sons, Inc | Hewitt, P. G., SUCH0CKI, J., & Hewitt, L. A. (1999). Conceptual Physical Science. (2 ed.). Addison Wesley Longman. Hirsch, A. S. (2002). Nelson Physics 12. Toronto: University Preparation. Hugh, D. Y., & Roger, A. F. (2012). University Physics with Modern Physics (13 ed.). San Francisco, USA: Pearson Education, Inc. IPCC. (1996). Economics of Greenhouse Gas limitation, Main report “Methodological Guidelines. John, M. (2009). Optical Fiber Communications, Principals and Practice (3rd Ed.). London: Pearsnon Prentice Hall. Jones, E. R., & Childers, R. L. (1992). Contemporary College Physics. (2 ed.). USA: Addison-Wesley Publishing Company. Kansiime, J. K. (2004). Coumpound Physical Geography: Morphology, Climatology, Soils and Vegetation. uganda. Linda, W. (2004). Earth Sceience demystified a self-teaching guide. USA: McGraw-Hill Campanies, inc. Michael, E. B. (1999). Schaum's outline of Theory and Problems of Physics for Engineering and Science. USA: McGRAW-HILL Companies, Inc. Michael, J. P., Loannis, M., & Martha, C. (2006). Science Explorer, Florida Comprehensive Science. Boston: Pearson Prentice Hall. |  |
| 05/12- 09/12/2022  **1 week**  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |  |
| 12-16/12/2022  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |  |
| 19-23/12/2022  **1 week**  **7 periods** | Marking+ reporting | Marking+ reporting | Marking+ reporting |  |  |  |

**REPUBLIC OF RWANDA CLASS & COMBINATION: S6…...**

**MINEDUC**

**GASABO DISTRICT CLASS SIZE…….**

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

**TEACHER’S NAMES………………………………………**

***2nd 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 |
| 09-  20/01/2023  **2 weeks**  **14 periods** | Topic:  **Environmental physics**  Unit:4  **Earthquakes, Tsunami, floods landslides and cyclones** | -Definition of Earthquakes, Tsunami, floods landslide and  cyclone  -Causes of earthquakes, Tsunami, floods landslide and cyclone.  -Intensity of earthquakes  -Size and frequency of earthquakes  -Seismic activity.  -Effect of earthquakes on environment (geological faults,  Volcanic activity, landslides, mine blasts, and nuclear tests).  -Earthquake location?  -Causes and occurrence of floods, landslides and Tsunami,  -Safety and emergency measures | -Work in groups simulate earthquakes, flood, tsunami, cyclone etc  -In groups, discuss relationship of physics concepts to occurrence of earthquakes, landslide, floods and tsunami  -Carry out internet search or occurrence and impact of earthquakes, Tsunami and landslides on the environment.  **Links to other subjects**:  Graphs in mathematics and Geography, interpretations and presentation. | Content and Activities for Term 1, 2& 3 Physics S6, REB |  |
| 23/01  -10/02/ 2023  3 weeks  21 periods | Topic:  **Atomic physics**  Sub-Topic:  **Nuclear physics**  Unit:5  **Atomic nuclei and radioactive decay**. | -Atomic nuclei-nuclide  -Radioactivity and nuclei stability  -Unified atomic mass  -Equivalent of atomic mass in electro volt  -Einstein’s mass-energy relation  -Binding energy and mass defect  -Nuclei fusion and fission  -Radioactivity radiations  -Radiation detectors  -Properties of emitted radiations  -Radioactive decay  -Application of radioactivity  -Hazards and safety precautions of when handling radiations.  - **General quiz** | -Discus and establish characteristics of radiations.  -Work in groups and establish the exponential decay rate equation.  -Discus methods of radiations detecting.  -Role-play radioactivity decay  -Discuss ways of protection against radiations.  -Group discussion on the hazards and precautions of radiations  -Make group presentation on the applications of radioactivity and write report  - Search internet to for details photoelectric emission.  **Links to other subjects:** Radioactivity and mutation (Biology, and Chemistry), History(carbon dating), Medicine(treatment of cancer),  Archaeology (carbon dating), Geology(radioactive).   * **General quiz** | Avison, J. (1989). The world of PHYSICS. Cheltenham: Thomas Nelson and Sons Ltd.  Content and Activities for Term 1, 2& 3 Physics S6, REB |  |
| 13/02-24/02/2023  **2 weeks**  **14 periods** | Topic  **Digital technology**  Sub-Topic:  **Analog and digital signals**  Unit:6  **Application of optical fiber in telecommunication**  **systems.** | -Definition of optical fiber  -Types of optical fiber: single mode, multi-mode and special purpose optical fibers.  -Principle of operation of optical fibers: refraction index of light, total internal reflection, and optical amplification.  -Mechanism of attenuation: light scattering and absorption.  - Light sources (transmitters and receivers).  -Repeater attenuation, regenerator and optical amplifiers.  -Optical transmitter and optical receiver.  -Advantages of digital  communication and optical fiber over other communication systems.  - **General quiz** | -Discuss terms used in optic fiber installation.  -Roles play on optic fiber transmission and communication.  -Search internet for functioning of optic fiber transmission.  **Links to other subjects**:  ICT (Internet, mobile phone, computers etc) in social sciences and in research.   * **General quiz** | Breithaupt, J. (2000). Understanding Physics For Advanced Level. (4 ed.). Ellenborough House, Italy: Stanley Thorners. |  |
| 27/02-10/03/2023  **2 weeks**  **14 periods** | Topic:  **Digital technology**  Sub-Topic:  **Analog and digital signals**  Unit:7  Block diagram of telecommunication systems | -Microphone  -Definition of; Audio frequency  (AF), amplitude Modulation (AM), frequency modulation (FM), Audio amplifier, short wave (SW), medium wave (MW),  -Carrier wave, and Modulator  -Oscillator, Radio frequency amplifier, Power amplifier  -Types of antenna  -Block diagrams of telecommunication systems.  - **General quiz** | -Discuss in groups parts of block diagram.  -Roles play communication of  microphone and antenna and present.  **Links to other subjects**: Biology-blood circulation transport, transmission of information etc.   * **General quiz** | Chand, S., & S.N., G. S. (2003). Atomic Physics (Modern Physics) (1 ed.). India  CPMD. (2015). Advanced Level Physics Sylabus. Kigali: REB. Cunningham, |  |
| 13-17/03/2023  **1 week**  **7periods** | Topic:  **Relativity and particle**  **Physics**  Sub-Topic:  **Particles and interaction**  Unit:8  **Nature of particles and their interactions** | -Elementary particles.  -Classification of elementary particles.  -Classification of particles by spin.  -Antiparticle.  -Pauli’s exclusion Principle  -Fundamental interactions by particle exchange  -Uncertainty Principle for time and energy and particle creation.  -Matter and antimatter (pair production and annihilation).  - **General quiz** | -Discuss in groups elementary particles and their identifications.  -Describe and discuss elementary particles in terms of mass and quantum numbers.  -Discuss classification of particles by spin.  -Research on antiparticles and report  -Discuss fundamental interactions in terms of exchange particles.  -Discuss in groups uncertainty principle for time and energy in the context of particle creation and report  -Search internet for details on matter and antimatter.  **General quiz** |  |  |
| 20-24/3/2023  **1 week**  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| 27/03-31/03/2023  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |

**REPUBLIC OF RWANDA CLASS & COMBINATION: S6…..**

**MINEDUC CLASS SIZE……..**

**GASABO DISTRICT**

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

**TEACHER’S NAMES……………………………………………………..**

***3rd TERM ,2022-2023***

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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 |
| 17-21/04/2023  **1weeks**  **7 periods** | Topic:  **Relativity and particle**  **Physics**  Sub-Topic:  **Quarks**  Unit:9  **Properties and basic principles of quarks**. | -Types of quarks.  -Terms quarks, antiquarks and  hadrons (baryons and mesons)  -The quark as constituent of proton and neutron.  -Baryon number and the law of conservation of baryon number.  -Spin structure of hadrons (baryon and mesons)  -Colour in forming of bound states of quarks.  -Colour as component of quarks and gluons. | -Discuss in groups quarks, antiquarks, and hadrons (baryons and mesons)  -Discuss in groups the quark as contents of proton and neutron.  -Discuss in groups baryon number and law of conservation of baryon number.  -Discuss in groups the spin structure of hadrons(baryon and mesons)  -Discuss in groups how colour forms bound states of quarks.  **Links to other subjects**: molecules, fluids, intermolecular force. | Content and Activities for Term 1, 2& 3 Physics S6, REB |  |
| 24/04-05/05/2023  **2 weeks**  **14 periods** | Topic:  **Electromagnetic waves**  Sub-Topic:  **x-rays**  Unit:10  **Effect of x-rays** | -Production of X-rays  -Properties of x-rays; uses and dangers  -X-rays as part of the electromagnetic spectrum  -The origins and characteristic  features of an x-ray spectrum.  -Applications of x-rays in medicine, industries, security, and scientific research.  -Problems involving accelerating  potential and minimum wavelength.  - **General quiz** | -Discuss in groups production of x-rays.  -Discuss in groups the origins of the features of characteristic x-ray spectrum.  -Discuss in groups application of x-rays in medicine, industries, research and scientific investigations.  -Solve problems on accelerating potential andminimum wavelength.  -Search internet on production of X-rays , spectrum characteristics  and applications.  **Links to other subjects:** Medicine(detection of fractures, cancer treatment), Transportation(detection of metal objects), Security departments.   * **General quiz** | Content and Activities for Term 1, 2& 3 Physics S6, REB  Advanced physics by Tom Duncan 9th Edition |  |
| 08-1905/2023  **2 weeks**  **14 periods** | Topic:11  **Electromagnetic waves**  Sub-Topic:  **LASER**  Unit:  **Effect of laser** | -Monochromatic and coherent sources of light.  -Properties of a LASER beam  -LASER beam as a source of coherent light.  -Production of LASER beam  -Applications and dangers of LASER beam  **- General quiz** | -Working in groups discuss and present meaning of monochromatic, coherent sources, stimulated emission and spontaneous emission  -Discuss in groups about LASER as a source of coherent light.  -Discuss in groups production  mechanism of LASER beam.  -Discuss in groups and present on applications and dangers of LASER beams.  -Search internet and use ICT simulators analyze characteristics properties of LASER beam.  **Links to other subjects**:  LASER application in telecommunication, Medicine(eye surgery) and in Mechanical engineering (drilling and  welding of metals)   * **General quiz** | Content and Activities for Term 1, 2& 3 Physics S6, REB |  |
| 22/05-02/06/2023  **2 weeks**  **14 periods** | Topic:  **Electromagnetic waves**  Sub-Topic:  **Medical Imaging**  Unit:12  **Medical Imaging** | -Sound pressure and variation in fluids.  -Frequency range for normal person  -Observed sound intensity and ear response  -Logarithmic response of the ear versus intensity.  -Specific purposes of imaging techniques  -Technology and radiation imaging (radiography and mammography)  -Ultrasound (echography), Endoscopy, thermography  -Radionuclide imaging  -Magnetic resonance imaging(MRI)  - **General quiz** | -Discuss in groups how sound pressure in air changes into larger  pressure with fluid variation  -Discuss in groups about the logarithmic response of the ear to intensity.  -Discuss the effects of various imaging techniques and their purposes.  **Links to other subjects:**  Fluids, molecules.   * **General quiz** | Content and Activities for Term 1, 2& 3 Physics S6, REB  Advanced physics by Tom Duncan 9th Edition |  |
| 05-16/06/2023  **2 weeks**  **14 periods** | Topic:  **Electromagnetic waves**  Sub-Topic:  **Radiation** Unit:13  **Radiation and Medicine.** | -Radiation dosimetry, exposure, absorbed dose, quality factor (relative to biological effectiveness) and dose equivalent  -Safety precautions to observed when handling radiations  -Concept of balanced risk.  -Physical half-life, biological half-life and effective half-life.  -Problems involving radiation dosimetry.  -The basics of radiation therapy for cancer treatment | -Discuss in groups the terms radiation dosimetry, exposure, absorbed dose, quality factor (relative biological effectiveness) and dose equivalent  -Discuss in groups safety precautions to taken while handling radiation.  -Discuss in groups evaluate physical half-life, biological half-life and effective half-life.  -Discuss in groups the basics of  radiation therapy for cancer and present results.  **Links to other subjects**:  gases, molecules, biology(radiotherapy), tracer elements (agriculture) | Content and Activities for Term 1, 2& 3 Physics S6, REB  Advanced physics by Tom Duncan 9th Edition |  |
| 19-23/06/2023  **2 weeks**  **14 periods** | Topic:  **Astrophysics**  Sub-Topic:  **Earth and space**  Unit:14  **Cosmology, Galaxies and Expansion of**  **universe** | -The structure of the Milky way  Galaxy.  -Types of Galaxies: spiral galaxies, elliptical galaxies, irregular galaxies  -Clusters of galaxies.  -Big Bang theory: Doppler shift due to cosmic expansion and  Hubble's law  **- General quiz** | -Working in group to analyze data from universities, and research organizations on the structure and types of galaxies.  -Use telescope and Galileo scope to observe planets and present the findings.  -Working in groups to solve problems on planetary motion.  -Search internet for  information on the structure of galaxies, the expansion of universe and their impact on environment.  **Links to other subjects**: Geography (climate change and seasons), telecommunication (radio, Global positioning system)   * **General quiz** | Advanced physics by Tom Duncan 9th Edition |  |
| 26/06-30/06/2023  **1 week**  **7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| 03-07/07/2023  **1 week**  **7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |
| 10-  14/07/2023  **1 week**  **7 periods** | Marking + Reporting | | | | |