**REPUBLIC OF RWANDA CLASS & COMBINATION: S5……..**

**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***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Time  | Topic, subtopic area and unit | Lesson title+ Evaluation | Learning activities and links to other subjects  | References and pedagogical materials  | Observation  |
| 26/10-21/11/2022  **4 weeks****28 periods** | Topic:**Light** Unit:**Wave and Particle nature of light** | * Planck’s quantum theory
* Photon theory of light and the photoelectric effect.
* Wave theory of monochromatic light.
* Properties of a light wave.
* Black-body radiation
* Measure of Plank’s constant
* Application of photoelectric effect.
* Energy, mass and momentum of photon
* Compton effect (X-rays).
* Photon interactions.
* Wave-particle duality:
* The principle of complementarities
* The wave nature of matter.
* Electron microscope.
* **General quiz**
 | * Make group

 presentation on Planck’s quantum Theory (hypothesis).* Discuss in groups

and make presentationsabout black and white body radiation* Solving problems on

light energy and photon theory* Perform an

experiment on photoelectric effect and report.**Links to other subjects:** Radiography and physiotherapy in Medicine, electrons and photons in Chemistry, Astronomy in geography.* **General quiz**
 | Avison, J. (1989). The world of PHYSICS. Cheltenham: Thomas Nelson and Sons Ltd.S5 physics student book, REB | . |
| 24/10-04/11/2022**2 weeks****14 weeks** | Topic:**Oscillations and wave**Sub-Topic:**Energy changes in simple harmonic** **Motion**Unit:**Simple harmonic motion.** | * Kinematics and simple

harmonic motion* Simple harmonic

oscillators.* Equations of simple

harmonic motion.* Energy changes and

conservation in oscillating systems.* Superposition of

harmonic motion with same frequency* **General quiz**
 | * Discuss in groups

kinematics and simple harmonic motion and report.* Discuss examples of

simple harmonic oscillators.* Working in groups

solve simple harmonic motion problems.* Derive expressions

of energy exchanges and conservation in oscillating systems.* Devise experiment to

illustrate superposition of harmonic motions of same frequency.* **General quiz**
 | Breithaupt, J. (2000). Understanding Physics For Advanced Level. (4 ed.). Ellenborough House, Italy: Stanley Thorners. |  |
| 07/11-02/12/2022**4 weeks****28 periods** | Topic:**Oscillations and wave**Sub-Topic:**Forced oscillations and resonance**Unit:**Forced oscillations and resonance of** **a system** | * Damped oscillations.
* Types of damped

oscillations.* Natural frequency of a

vibration and forced oscillation.* Variation of forced

frequency on graph at amplitude close to natural frequency of vibration.* Examples of resonance
* Effect of resonance on

a systems* **General quiz**
 | * Perform an

experiment to demonstrate damping of oscillating systems.* Suggest examples of

damped oscillators.* Working in groups

of 3’s to discuss natural vibration and forced oscillations* Graphically illustrate

forced oscillations.* Perform an

experiment on resonance and suggest more examples on it. * Use computer

Simulation to analyze forcedoscillations and resonance in systems.**Links to other subjects**: Beats in music, electrons* **General quiz**
 | Chand, S., & S.N., G. S. (2003). Atomic Physics (Modern Physics) (1 ed.). IndiaCPMD. (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 |  |
| **05-09/12/2022****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 |  |  |

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**GASABO DISTRICT**

**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:**Oscillations and wave**Sub-Topic:**Waves**Unit:**Propagation of mechanical waves.** | * Wave concept
* Types of waves
* Waves Terms
* Characteristics of waves
* Relationship between

wavelength, frequency (Period)and velocity* Properties of waves

(Reflection, refraction, interference, diffraction)* Young double slit

Experiment* Progressive and

stationary waves* Equation of a progressive wave
* Example of progressive,

Wave on a vibrating string* **General quiz**
 | * Practical

demonstration of wave concept* Demonstrate

 longitudinal and transverse waves using rope and slinky spring.* Use ripple tank to

demonstrate wave fronts, frequency, crest/trough, * Use a vibrating

 rope to demonstrate nodes and antinodes* Use guided

discovery on interference of sound wave coherent source and microphone connected to a cathode ray oscilloscope* Use group

discussion to describe Young’s double slit experiment to determine wavelength, slit separation and fringe separation.* Use internet to

 access information on applications of waves.**Links to other subjects:** Telecommunication and Music* **­General quiz**
 | S5 physics student book, REBAdvanced 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 |  |
| 23/01-03/2023**2 weeks****14 periods** | Topic:**Electricity**Sub-Topic:**Current electricity**Unit:**Complex electrical circuit** | * Kirchhoff ‘s laws

 (Junction rule and loop rule).* Resistors and

 electromotive forces in series and parallel * complex circuits.
* Design of complex

 electrical circuits.* Simple potentiometer circuits.
* Advantages and

 disadvantages of potentiometer.* Potentiometer and other

devices (Ammeter and voltmeter.).* Problems involving

complex circuit.* **General quiz**
 | * Perform complex

circuit analysis using Kirchhoff’s laws.* Discuss in groups

applications of Kirchhoff ‘s laws * Work in groups and

 Present on steps for analyzing a complex electric circuit.* Experimentally

design circuit to illustrate application of simple potentiometer* Discuss in groups

Advantages and disadvantages of potentiometer over voltmeter and report.* Solve complex

 problems on the potentiometer.**Links to other subjects:** Electrons and conductor( chemistry).Radio Volume adjustment Circuits* **General quiz**
 | S5 physics student book, REBAdvanced 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 |  |
| 06-17/02/2023**2 weeks****14 periods**  | Topic:**Energy, power and climate change** Unit:**Fossil and non fossil fuel and power production** | -Definition of Fossil fuel and non-fossil fuel -Controlled and uncontrolled nuclear fission.-Controlled fission (power production) and uncontrolled fission (nuclear weapons)-Energy transformations in a nuclear power station.-Problems associated with the production of nuclear power-Advantages and disadvantages associated with transportationand storage of fossil fuels.-Environmental problems of fossil fuels -Safety issues and risks associated with nuclear power.- **General quiz** | -Research in scientific for environmental problems associated with use of fossil fuels in power stations.-Discuss in groups and present on problems of using nuclear power.-Discuss in groups and make presentations on safety issues and risks of nuclear power stations.-Search internet for cleaner energy sources**Links to other subjects:** Graphs in Mathematics and Geography, Elements and fission in Chemistry, Data presentations and interpretations in Geography.* **General quiz**
 | S5 physics student book, REBAdvanced 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 |  |
| 20/02-03/03/2023**2 weeks****14 periods** | Topic:**Motion in fields** Sub-Topic:**Electric field potential and energy** Unit:**Electric field potential and gravitational potential.** | -Electric potential energy and potential difference.-Electric potential and electric field.-Electric potential due to point charges.-Potential due to electric dipole.-Conservation of electric energy.-Cathode ray tube :( TV, computer monitors and cathode ray oscilloscope).-Electrodynamics.-Gravitational field and gravitational potential.-Energy conservation in electricand gravitational fields.-Solve problems on electric and gravitational fields.- **General quiz** | -In groups discuss, calculations of potential due to one or more point charges.-In group discuss, determine potential due to one or more point masses.-In groups, analyze and interpret the path of a charge in cathode ray tube and report-Discuss in groups and present, the difference between electric andgravitational potential. -Using ICT tools to simulate electric and gravitational potential**Links to other subjects:** electrocardiography (Medicine), ICT.* **General quiz**
 | S5 physics student book, REB |  |
| 06-10/03/2023**1week****7 periods** | Topic:**Motion in fields** Unit:**Motion in Orbits** | -Newton’s law of gravitation.-Kepler’s laws of planetary motion.-Verification of Kepler’s third law of planetary motion.-Verification of acceleration due to the gravity at the surface of the Earth.-Variation of gravity above and below the earth surface.-Satellites and Rockets.-Satellites and their applications.-Work done in planetary motion.-Cosmic velocity (first, second and third).- Problems on motion in orbits.- **General quiz** | -Use simulators to demonstrate Kepler’s laws of planetary motion and present-In working in groupsdiscuss Kepler’s laws of planetary motion and present summary.Discuss in groups cosmicvelocities and present findings. -Work in groups to compute problems related to planetary motion and cosmic velocities. Search internet for details on planetary motion.**Links to other subjects**: Electron motion (Chemistry) and solar system (Geography)* **General quiz**
 | S5 physics student book, REBAdvanced 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 |  |
| 13-17/03/2023 **1week****7 periods** | Topic:**Atomic physics** Sub-Topic:**Quantum physis**Unit:**Atomic models and photoelectric effect.** | -Structure of atom. -Atomic models (Rutherford’s atomic model and Bohr’s atomic model)-Energy levels and spectral lines.-Thermionic emission ( thermo electronic emission)-Applications of cathode rays (oscilloscope and TV tubes)-Photoelectric emission laws’-Photoelectric effect-Factors affecting photoelectric emission-Photon, work function and Plank constant-Einstein’s equation photoelectric effect-Application of photoelectric effect-Compton effect. | - Use simulators to demonstrate emission of spectra lines from various materials-In groups discuss Rutherford and Bohr atom models (enumerate similarities and differences)-Discuss thermo electronic emission phenomenon in TV tubes.-Establish mathematically the deflection of an electron in an electric field.-Describe photoelectric emission experiments-Establish the Comptonwavelength using the laws of conservation of linear momentum and energy. -Search internet for applications of photoelectric emission | S5 physics student book, REB |  |
| **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 |  |  |

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**TEACHER’S NAMES……………………………………**

3RD TERM 2022-2023

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Time  | Topic, sub topic area and unit | Lesson title+ Evaluation | Learning activities and links to other subjects  | References and pedagogical materials  | Observation  |
| 17-28/04/2023**2 weeks****14periods** | Topic:**Digital technology**Sub-Topic:**Analog and digital signals**Unit:**Analog and digital signals** | -Types of information and requirements.-Simplex, half-duplex and full-duplex communications.- Frequency and bandwidth.-Analogue signal system.- Principle of digital signal systems -Advantages of digital technology- Examples of messages- **General quiz** | -Work in groups and discuss analogue and digital system of communication.-Role play advantages of digital system and compare with analogue system.-Work in groups to analyse logic gates (AND, NAND, OR, NOR, NOT…) and Report**Links to other subjects**: blood circulation, transport, transmission of information Computer (number representation)* **General quiz**
 | S5 physics student book, REB |  |
| **01-12/05/2023****2 weeks****14periods** | Topic:**Digital technology**Sub-Topic:**Analog and digital signals**Unit:**Mobile phone and radio communication**. | -Concepts of transmission system.-Principle of cellular radio -Structure of cellular network.-Principle of cellular network.-Mobile communication systems.- Radio transmission (AM, FM, PM).-Post, telegraph and telephone (PTT).- **General quiz** | -Discuss difference in telephone and radio systems-Role play in groups about types of modulation-Work in groups and assemble simple cellular radio.**Links to other subjects**: blood circulation (Biology and Medicine), transport networks, transmission of information...* **General quiz**
 | S5 physics student book, REB |  |
| 15-26/05/2023**2 weeks****14periods** | Topic:**Relativity and particle physics**Sub-Topic:**Concepts and postulates of** **Special relativity**Unit:**Relativity concepts and postulates of special** **relativity** | -Definition of relativity-Concept of space, time and mass.-Concept of Frame of reference-Galilean equation of transformation-Postulates of special theory of relativity-Concept of simultaneity.- **General quiz** | -Use simulations and role plays to demonstrate relativity and postulates of special relativity.-In groups discuss space, time and mass and report results-Discuss in groups frame and inertial frame of reference and present-Discuss in groups Galilean equation of transformation.-Solve problems involving relative velocity using Galilean transformation equation.-Discuss in groups simultaneity.-Search internet for relativity and postulates of special relativity.**Links to other subjects**: Space (Geography).* **General quiz**
 | S5 physics student book, REBAdvanced 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 |  |
| **29/05-09/06/2023****2 weeks****14periods** | Topic:**Electromagnetic waves**Sub-Topic:**Electromagnetic waves and interference of light Waves**Unit:**Interference of light waves.** | -Nature of electromagnetic waves.-Conditions for interference to occur given two sources of light.-Principle of superposition,-Interference patterns of twocoherent point sources of light.-Double-slit experiment -Intensity distribution of fringe pattern.-Problem’s double- slit experiment.- **General quiz** | -Discuss in groups conditions necessary forinterference-Discuss in groups the principle of superposition and production of interference patterns from two coherent point sources.-Devise and perform double-slit experiment and estimate the wavelength of light -Solve problems double slit experiment -Search internet for information on light interference.**Links to other subjects:** Electrons (chemistry)* **General quiz**
 | 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, IncAdvanced Physics by TOM Duncan 9th edition |  |
| **12-23/06/2023****2 weeks****14periods** | Topic:**Astrophysics**Sub-Topic:**Earth and space**Unit:**Stellar distance and radiation** | -Sun's atmosphere and interior-Brightness and magnitude scale-Star temperature, color, and spectra -Types of stars: -Spectra of stars -Hertzsprung-Russel diagram-Stellar distance and masses: Parallax, binary stars and mass luminosity relationship.- **General quiz** | -Work in groups to analyze the sun’s atmosphere and report-Work in groups to observe stars brightness, color spectra and presentto observe planets and present findings-Solve problems on planetary motion. -Search internet for simulations on planetary motion.**Links to other subjects:** Geography (Planet motion)* **General quiz**
 | 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, IncAdvanced Physics by TOM Duncan 9th edition |  |
| **26/06-03/07/2023****1 week****7 periods** | Revision + Examination | Revision + Examination | Revision + Examination |  |  |
| **03-****07/2022****1 week****7 periods** | Examination+ marking | Examination+ marking | Examination+ marking |  |  |
| 10-14/07/20231 week7 periods | Marking +school report | Marking + school report | Marking + school report |  |  |