

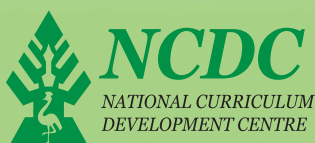


THE REPUBLIC OF UGANDA  
Ministry of Education and Sports

# ADVANCED SECONDARY CURRICULUM



## PHYSICS ASSESSMENT GUIDELINES



2026

# **ADVANCED SECONDARY CURRICULUM**

---

## **PHYSICS** **ASSESSMENT GUIDELINES**

**2026**



Copyright © National Curriculum Development Centre, Uganda 2026

A product of the National Curriculum Development Centre for the Ministry of Education and Sports with support from the Government of Uganda

National Curriculum Development Centre  
P.O. Box 7002,  
Kampala- Uganda  
[www.ncdc.co.ug](http://www.ncdc.co.ug)

**ISBN: 978-9970-494-64-4**

All rights reserved: No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior permission of the copyright holder

## Contents

|                                                                                     |           |
|-------------------------------------------------------------------------------------|-----------|
| <b>Acknowledgements.....</b>                                                        | <b>v</b>  |
| <b>1. Introduction .....</b>                                                        | <b>1</b>  |
| 1.1 Assessment Objectives .....                                                     | 1         |
| 1.2 Linkage Between Assessment Objectives, Constructs and Syllabus.....             | 2         |
| <b>2. Table of Constructs.....</b>                                                  | <b>4</b>  |
| <b>3. Structure of the Assessment Papers.....</b>                                   | <b>46</b> |
| Scoring Rubrics for Physics Paper One (Theory Paper) .....                          | 57        |
| Scoring Rubric for Advanced Level Physics Paper Two (Practical)<br>Assessment ..... | 67        |
| <b>4. Performance Level Descriptors.....</b>                                        | <b>75</b> |

## Acknowledgements

The National Curriculum Development Centre (NCDC) is indebted to the Government of Uganda for financing the development of these Assessment Guidelines to support the implementation of the Advanced Secondary Curriculum.

Our gratitude goes to the Ministry of Education and Sports for overseeing the development process, the Curriculum Task Force of the Ministry of Education and Sports for the guidance and timely decisions whenever necessary, and members of the public who made helpful contributions towards shaping these Guidelines.

NCDC is also grateful to UNEB, Members of Parliament, schools, universities, and other tertiary institutions, the writing panels, critical reviewers, and professional bodies for their contribution towards the design and development of these Assessment Guidelines. To all those who worked behind the scenes to finalise the production of these Guidelines, your efforts are invaluable.

NCDC takes responsibility for any shortcomings that might be identified in this publication and welcomes suggestions for effectively addressing the inadequacies. Such comments and suggestions may be communicated to NCDC through P. O Box 7002, Kampala, or Email: [admin@ncdc.go.ug](mailto:admin@ncdc.go.ug) or on the Website: [www.ncdc.go.ug](http://www.ncdc.go.ug)



Dr Bernadette Nambi Karuhanga

**Director**

**National Curriculum Development Centre**



## 1. Introduction

This assessment guidelines document has been developed as a companion to the Assessment Framework for Advanced Secondary Curriculum and should be read and applied in conjunction with it. The Framework provides the overarching principles, standards, and requirements for assessment across all subjects, while this guideline contextualises those provisions to the specific demands and practices of Physics as a subject.

End of the Cycle Assessment of Physics will be administered by the Uganda National Examinations Board (UNEB). The assessment will be guided by four assessment objectives drawn from the four assessment constructs i.e force and motion, energy, charges and fields, and particles. The assessment items will be set at the level of the construct allowing learners to integrate knowledge, skills and values drawn from the topics within each construct in order to address a societal challenge or problem.

### 1.1 Assessment Objectives

Assessment objectives for Physics focus on the learner's ability to:

**AO1:** Evaluate how forces affect static, moving bodies and their structures and use this knowledge to design safe, efficient, and practical solutions in everyday situations.

**AO2:** Investigate how energy is transferred and transformed, design devices and systems used in daily life, industry, and technology that employ energy transformations.

**AO3:** Explore how electric and magnetic fields interact in systems and devices, and use this understanding to explain and model technologies for power transmission, energy storage, and electronic control in daily life and industry.

**AO4:** Investigate atomic, quantum and nuclear phenomena, and use this understanding to explain how modern technologies work and assess the benefits and risks of their applications.

## 1.2 Linkage Between Assessment Objectives, Constructs and Syllabus

The table below shows the linkage between the assessment objectives, the constructs and the topics in the syllabus that contribute to the construct.

**Table 1:**

Table showing relationship between assessment objectives, constructs and the topics in the syllabus

| Assessment Objective | Construct        | Construct Description                                           | Topics as arranged in the Syllabus                                                                                                                                                                                                                                                               |
|----------------------|------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AO1                  | Force and motion | Analysis of how force affects the state of bodies               | 1) Measurement and Dimensions of Physical Quantities<br>2) Statics<br>3) Linear Motion<br>4) Motion Under Gravity<br>5) Work, Energy and Power<br>6) Solid Friction<br>7) Fluid Mechanics<br>8) Mechanical Properties of Matter<br>20) Circular Motion<br>22) Gravitation                        |
| AO2                  | Energy           | Exploration and application of energy forms and transformations | 9) Thermometry<br>10) Heat Quantities<br>11) Transfer of Heat<br>12) Behaviour of Gases<br>13) Thermodynamics<br>14) Reflection of Light<br>15) Refraction of Light<br>16) Optical Instruments<br>21) Simple Harmonic Motion<br>23) Progressive Waves<br>24) Stationary Waves<br>25) Sound Waves |

|     |                    |                                                                                 |                                                                                                                                                                                                                          |
|-----|--------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A03 | Charges and Fields | Exploration of how electric and magnetic fields interact in systems and devices | 17) Electrostatics<br>18) Capacitors<br>19) Digital Electronics<br>26) Current Electricity<br>27) Magnetism in Matter<br>28) Magnetic Effect of an electric Current<br>29) Electromagnetic Induction<br>30) A.C Circuits |
| A04 | Particles          | Investigation of atomic, quantum, and nuclear phenomena and their applications  | 31) Atomic Particles<br>32) Quantum Theory<br>33) Nuclear Processes                                                                                                                                                      |

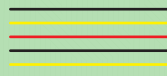
## 2. Table of Constructs

The table below details the constructs for Physics, i.e. the learning outcomes that make up the construct, the expected learner abilities and what the assessors should look out for in the learner's work as evidence of achievement of the intended abilities.

| CONSTRUCT AND ITS DESCRIPTION                                                     | LEARNING OUTCOMES<br><i>The learner should be able to;</i>                                                                                                                                                                                                          | ABILITIES<br><i>The learner is able to:</i>                                                    | INDICATORS OF MASTERY<br><i>The learner:</i>                                                                                                                        | LEVEL OF COMPLEXITY |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>Force and Motion</b><br><br>Analysis of how force affects the state of bodies. | i) measure a variety of physical quantities in the environment with minimal errors ( $v/a$ , $s$ , $gs$ )<br>ii) analyse the dimensions of a variety of derived physical quantities and use them to check the consistency of equations ( $v/a$ , $u$ , $s$ , $gs$ ) | a) manipulate the measuring instruments.<br>b) use dimensions to derive and analyse equations. | i) reads and records values from different measuring instruments to the correct accuracy and units.<br>ii) derives and checks equations using dimensional analysis. | Medium              |

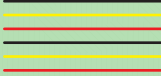
|                                                                                                                                                                                                                                                                                                  |                                                                                                                                                         |                                                                                                                                                                                                                                                                   |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <p>i) determine the resultant of vectors in different situations (<math>v/a</math>, <math>u</math>, <math>s</math>)</p> <p>ii) appreciate the concepts of moments and torque in the construction of different structures (<math>u</math>, <math>s</math>, <math>gs</math>, <math>v/a</math>)</p> | <p>a) investigate the effects of multiple forces on bodies.</p> <p>b) investigate the centre of gravity of different shapes and moment of a couple.</p> | <p>i) sketches diagrams for different forces acting on static bodies.</p> <p>ii) Determines resultant force of vectors in different situations using the concepts of moments.</p> <p>iii) creates stable structures using the knowledge of centre of gravity.</p> | <p>High</p> |
| <p>i) derive the equations describing the linear motion of uniformly accelerated objects and apply them in a variety of situations (<math>u</math>, <math>s</math>, <math>gs</math>)</p>                                                                                                         | <p>a) analyse and represent the motion of bodies using equations and graphs.</p>                                                                        | <p>i) derives the equations of motion by using different methods and applies them in a variety of situations.</p> <p>ii) applies Newton's laws and explains their</p>                                                                                             | <p>High</p> |

|                                                                                                                            |                                                                                                                        |                                                                             |                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>ii) determine the relative velocity and the distance of closest approach for moving bodies in real life. (u, s, gs)</p> | <p>iii) verify the principle of conservation of linear momentum and apply it in a variety of situations (u, s, gs)</p> | <p>iv) apply Newton's laws of motion in different situations (u, s, gs)</p> | <p>b) describe Newton's and other laws governing the motion of bodies.</p> <p>c) Describe implications on the laws of motion to bodies in different situations.</p> <p>d) experiment with bodies about the effect of gravity on moving bodies.</p> <p>e) analyse motion of bodies with different velocities in different directions to determine closest approach.</p> | <p>implications to moving bodies in different situations.</p> <p>ii) derives equations relating to projectile motion and applies them in real life situations.</p> <p>v) describes energy and momentum change in interacting bodies and their implications.</p> <p>v) determines relative velocity of bodies and the distance of closest approach using different methods.</p> |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



|                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>i) analyze the behavior of bodies moving under gravity (<math>u, s, gs</math>)</p> <p>ii) derive the equations of projectile motion and apply them in different real-life situations (<math>v/a, u, s, gs</math>)</p> | <p>a) analyse acceleration due to gravity and its implication and application to real life situations.</p> <p>b) derive expressions for Projectile motion and apply them in a variety of real-life situations.</p> <p>c) model systems that employ projectile motion.</p> | <p>i) determines the value of acceleration due to gravity using a variety of methods and assesses the suitability of the methods.</p> <p>ii) explains the effects of acceleration due to gravity to bodies in the universe.</p> <p>iii) derives the expressions used in projectile motion and applies them to solve real life problems.</p> <p>iv) models systems that employ</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                |                                                                                                                   |                                                                                                                   |                                                                                                                                       |        |
|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                                                                                |                                                                                                                   |                                                                                                                   | projectile motion and describes their mode of operation.                                                                              |        |
| i) investigate the forces acting on bodies moving in circular paths and how they relate to safety ( $u$ , $s$ , $g$ s, $v/a$ ) | a) investigate the forces acting on bodies moving in circular paths and their effects.                            | a) investigate the forces acting on bodies moving in circular paths and their effects.                            | i) explains the terminologies relating to motion in curved paths and describes their implications.                                    | Medium |
| ii) derive the expressions for motion under conical pendulum and apply them in real life ( $u$ , $s$ , $v/a$ )                 | b) express the motion of a conical pendulum by resolving forces and relating them to angular velocity and period. | b) express the motion of a conical pendulum by resolving forces and relating them to angular velocity and period. | ii) derives expressions for angular velocity, angular acceleration and centripetal force and applies them in a variety of situations. |        |
| iii) investigate the conditions for non-skidding on banked and horizontal roads to ensure safety ( $u$ , $v/a$ )               | c) evaluate the conditions for non-skidding/safety of bodies moving on curved paths.                              | c) evaluate the conditions for non-skidding/safety of bodies moving on curved paths.                              |                                                                                                                                       |        |

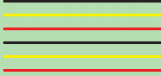


|  |                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                            |      |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  | <p>i) apply the laws and principles of gravitation to real life (<math>u, v/a, gs</math>)</p> <p>ii) investigate the effect of gravity on bodies orbiting in space such as communication satellites and related phenomena (<math>u, s, gs</math>)</p> | <p>a) describe the laws of gravitation, derive expressions for the universal gravitation constant and solves numerical problems.</p> <p>b) investigate the effect of gravity on the operations of satellites.</p> | <p>i) explains the effect of gravity as the central force keeping satellites in orbit.</p> <p>ii) models or simulates the motion of a satellite under the influence of gravity.</p> <p>iii) describes the role of parking orbits in launching communication satellites.</p> <p>iv) describes the link between gravity and orbital path to real world technologies like</p> | High |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|

|                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                   |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------|
|                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                      | satellite phones, GPS and television.<br>v) solves numerical problems relating to orbital motion. | Medium |
| <p>i) derive expressions for work, power and energy, and apply them to solve real-life problems (u, s, gs)</p> <p>ii) explain the work-energy theorem, conservative and non-conservative force fields and how they relate to different bodies (u, s, gs)</p> <p>iii) describe the structure and the energy production process of the Sun and its</p> | <p>a) explain principles of energy transformation and its relations.</p> <p>b) describe the natural processes through which energy resources are harnessed and utilised in various systems.</p> <p>c) implement energy saving measures such as use of energy-efficient appliances, insulation and</p> | <p>i) derives and applies equations relating to energy efficiency in real life.</p> <p>ii) compares the efficiency of energy systems and suggests practical solutions for improving them.</p> <p>iii) describes the sun's internal structure and how it transfers energy to sustain life on earth.</p> <p>iv) analyses the impact of renewable and non-renewable</p> |                                                                                                   |        |

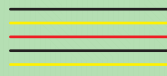
|  |                                                                                                                                                                                                                                  |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                     |        |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|  | implication to life on Earth (u, v/a, gs)<br>iv) apply the concepts of renewable and non-renewable energy resources in the conservation of energy (u, s, gs, v/a)                                                                | renewable energy sources.                                                                                                                                                     | sources of energy on the environment.                                                                                                                                                                                                                                               |        |
|  | <p>i) investigate the nature of friction between static bodies and its implications (u, s, gs, v/a)</p> <p>ii) investigate the effects of friction on dynamic bodies in order to improve the operation of systems (u, s, gs)</p> | <p>a) describe factors that affect the magnitude of friction.</p> <p>b) investigate friction between static and dynamic objects and its implications on motion of bodies.</p> | <p>i) analyses scenarios where static and dynamic friction occur and how they affect motion of objects.</p> <p>ii) compares the magnitudes of static and dynamic friction of various materials and their implications.</p> <p>iii) models systems that apply static and dynamic</p> | Medium |

|                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                            |                                             |      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------|
|                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                            | friction and demonstrates how they operate. | High |
| <p>i) examine molecular forces in liquids and their implications (<math>u</math>, <math>s</math>, <math>gs</math>)</p> <p>ii) assess the application of pressure in fluids in different situations (<math>s</math>, <math>u</math>)</p> <p>iii) explain pressure variations in flowing fluids and its applications in various situations (<math>u</math>, <math>s</math>, <math>v/a</math>)</p> | <p>a) explain how intermolecular forces influence physical properties of fluids.</p> <p>b) design experiments to investigate fluid properties and behaviour.</p> <p>c) utilise principles such as, Pascal, Bernoulli and Stoke to model and analyse fluid dynamics.</p> | <p>i) calculates fluid pressure, rate of flow and lift force on an air foil in different situations.</p> <p>ii) applies Pascal's and Bernoulli's principles to explain fluid behaviour in systems.</p> <p>iii) applies the concept of fluid pressure to explain phenomena like buoyancy, fluid statics, etc.</p> <p>iv) designs fluid systems using principles of fluid pressure and molecular forces.</p> |                                             |      |



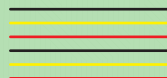
|  |                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                      |        |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|  | <p>i) investigate the elastic and plastic behaviour of stretched materials and their implications (s, gs)</p> <p>ii) investigate Young's Modulus and the work done during elastic extension and compression process of elastic materials (u, s, gs, v/a)</p> | <p>a) explain how types of strength of materials relate to their ability to withstand various forces.</p> <p>b) investigate how materials respond to different forces.</p> <p>c) assess the suitability of materials for construction purposes.</p> | <p>i) explains the importance of strengths of different materials in construction.</p> <p>ii) derives expressions for stress, strain and Young's Modulus and uses them to solve related numerical problems.</p> <p>iii) investigates how materials respond to different forces attached to them.</p> | Medium |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|

|                                                                                       |                                                                                                                                                                                                        |                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                     |        |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>Energy</b><br><br>Exploration and application of energy forms and transformations. | i) relate the expressions of temperature scales in order to solve real life problems (k, s, gs, v/a)<br>ii) compare different types of thermometers and how they are used in real life (u, s, gs, v/a) | a) investigate the different types of thermometers by examining their construction and modes of operation.<br>b) derive expressions for different temperature scales.<br>c) model different types of thermometers using locally available materials. | i) describes the structure and mode of operation of the different types of thermometers.<br>ii) solves numerical problems related to temperature scales in different situations.<br>iii) designs different types of thermometers using locally available materials. | Medium |
|                                                                                       | i) explain the mechanism of heat conduction in solids and how it applies to materials in heat systems (u, gs, v/a)<br>ii) examine the significance of                                                  | a) explain fundamental principles behind various modes of heat transfer and the factors influencing them.                                                                                                                                            | i) examines the mechanisms of the different modes of heat transfer, factors affecting them and their implications to real life.                                                                                                                                     | High   |



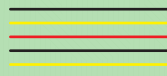
|  |                                                                                                                                                                                                               |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                   |             |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|  | <p>convection in explaining weather and climate (u, gs, v/a)</p> <p>iii) deduce that heat can be transferred in form of electromagnetic radiations and this has many real-life applications (s, gs, v, a)</p> | <p>b) use the laws to deduce equations governing heat transfer and apply them to solve numerical problems.</p> <p>c) describe the application of heat transfer processes.</p> <p>d) model appliances that employ principles of heat transfer.</p> | <p>ii) calculates the co-efficient of thermal conductivity and temperature of a black body in different situations.</p> <p>iii) describes thereal-life applications of thermal conductivities, convection currents and black body radiation.</p> <p>iv) designs different devices that use principles of heat transfer and describes their mode of operation.</p> | <p>High</p> |
|  | <p>i) deduce that different objects require different amounts of heat to change their</p>                                                                                                                     | <p>a) conduct experiments to determine heat quantities of</p>                                                                                                                                                                                     | <p>i) determines the specific heat capacity SHC, latent heat of vaporisation</p>                                                                                                                                                                                                                                                                                  |             |

|  |                                                                                                                                     |                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>temperatures (u, gs, s, v/a)</p> <p>ii) evaluate the concept of change of state and its implication in real life. (u, s, gs)</p> | <p>different substances using a variety of methods.</p> <p>b) solve related numerical problems.</p> <p>c) model systems that use concept of heat quantities to improve energy conservation.</p> | <p>and fusion of solids and liquids using different methods and assesses the suitability of the methods.</p> <p>ii) solves numerical problems related to heat quantities using a variety of methods.</p> <p>iii) describes the applications of Newton's law of cooling in explaining real life cooling processes.</p> <p>iv) designs systems that use heat capacity and latent heat to improve energy conservation.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



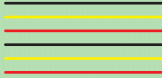
|  |                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  | <p>i) analyse the behaviour of ideal gasses under different conditions (u, s, gs)</p> <p>ii) evaluate the kinetic theory of gases and use it to derive the expression for the pressure exerted by the gas (s, u, gs)</p> <p>iii) modify the ideal gas equation to suit the behaviour of real gases(u)</p> <p>iv) infer that vapours exert pressure and that this has many real-life applications (u, s, gs, v/a)</p> | <p>a) explain the effect of heat on gases.</p> <p>b) investigate gas properties under heat.</p> <p>c) solve numerical problems related to gas laws and ideal gas equation.</p> <p>d) apply gas behaviour to real-world applications.</p> <p>e) describe how vapours are applied in different situations.</p> | <p>i) derives ideal gas equations and applies them in different situations.</p> <p>ii) models devices that utilise gas behaviour under different conditions.</p> <p>iii) modifies ideal gas behaviour to suit real gas behaviour.</p> <p>iv) describes the variation of saturated vapour pressure of water with temperature and its implication.</p> <p>v) sketches and describes P-V graphs showing the variation of SVP, USVP with temperature.</p> | High |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|

|                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                  |               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| <p>i) deduce that every system has internal energy which is a function of its temperature (<math>u, s</math>)</p> <p>ii) analyse the first law of thermodynamics and its implications in real-life situations (<math>u, s, gs</math>)</p> | <p>a) identify common compression gas systems in domestic and industrial settings.</p> <p>b) explain the behaviour of gases under pressure using relevant gas laws and illustrate them on graphs.</p> <p>c) explain how pressure, volume and temperature vary for compressed system of gases.</p> | <p>i) describes the safety precautions when handling compressed gas systems.</p> <p>ii) derives the expression for the pressure exerted by the gas and applies them in deriving the ideal gas equations.</p> <p>iii) derives expressions involving pressure, volume and temperature of systems and applies them in different situations of compressed gases.</p> | <p>High</p>   |
| <p>i) employ the laws of reflection of light at plane surfaces to</p>                                                                                                                                                                     | <p>a. design and perform investigations to compare reflective</p>                                                                                                                                                                                                                                 | <p>i) draws labeled ray diagrams for the formation of images</p>                                                                                                                                                                                                                                                                                                 | <p>Medium</p> |



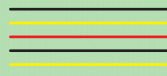
|  |                                                                                                                               |                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>resolve different life scenarios (u, v/a)</p> <p>ii) apply curved reflecting surfaces in real-life situations (u, v/a)</p> | <p>properties of different surfaces.</p> <p>b. use optical instruments to measure the reflected light intensity and angles accurately.</p> <p>c. draw and interpret ray diagrams involving multiple reflections.</p> | <p>in plane and curved mirrors.</p> <p>ii) derives expressions for the angle of deviation and glancing angle for two mirrors at an incline, rotated mirrors and describes their applications.</p> <p>iii) derives expressions related to the curved surfaces and applies them in a variety of situations.</p> <p>iv) determines focal length of curved mirrors using various methods and assesses the suitability of the methods.</p> |
|--|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                      |  |  |                                                                                                                                                                                                                                                                                                              |        |
|----------------------------------------------------------------------------------------------------------------------|--|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                                                                      |  |  | v)<br>models simple devices that apply reflection of light and describes their mode of operation.                                                                                                                                                                                                            |        |
|                                                                                                                      |  |  | i)<br>derives equations about Snell's law and applies them to glass blocks and glass prisms.<br>ii)<br>determines the refractive index of materials using different methods and assesses the suitability of the methods.<br>iii)<br>describes the effects of total internal reflection and its applications. | Medium |
|                                                                                                                      |  |  | a. investigate the refractive indices of various refractive materials.<br>b. explain scientific principles of refraction.<br>c. analyse the effect of refractive indices for different materials use.                                                                                                        |        |
|                                                                                                                      |  |  | i) apply the concept of refraction on plane surfaces to various situations in real life (u, gs, v/a)<br>ii) analyse the concepts of critical angle and total internal reflection and their implications (u, v/a, s, gs)<br>iii) apply lenses in solving a variety of problems in the community (u, gs, v/a)  |        |
| <b><i>Charges and fields</i></b><br>Exploration of how electric and magnetic fields interact in systems and devices. |  |  |                                                                                                                                                                                                                                                                                                              |        |



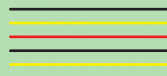
|  |  |                                                                                                                                                      |                                                                                                                                                                                                                                                |                                                                                                                                    |
|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|  |  |                                                                                                                                                      | iv) derives the expressions related to refraction in thin lenses and applies them in a variety of situations.<br>v) determines the focal length of thin lenses using a variety of methods and analyses the suitability of each of the methods. |                                                                                                                                    |
|  |  | i) explain the principle of operation of a compound microscope and their real-life applications (u, s)<br>ii) describe the principle of operation of | a. identify and describe the structure and working principles of different optical instruments.<br>b. use different optical instruments to                                                                                                     | i) describes the mode of operation and applications of various optical instruments.<br>ii) derives expressions relating to optical |
|  |  |                                                                                                                                                      |                                                                                                                                                                                                                                                | High                                                                                                                               |

|                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                             |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| <p>refracting telescopes and their applications (u, s)</p>                                                                                                                                                                                | <p>observe and measure magnification and image distance.</p>                                                                                                                                                                                      | <p>iii) instruments and how they are applied in various. models optical devices that employ the concepts of refraction.</p>                                                                                                                                                                 |             |
| <p>i) explain terminologies used in simple harmonic motion (SHM) and apply them to oscillating systems (u, s)<br/>ii) explore energy conservation in oscillating systems and its implications in various daily experiences (u, s, gs)</p> | <p>a. identify and describe physical systems that exhibit SHM.<br/>b. derive and apply equations of SHM to solve numerical problems.<br/>c. design and carryout investigations using SHM.<br/>d. model and design oscillating system devices.</p> | <p>i) explains the terminologies used in SHM and their implications.<br/>ii) describes the applications of SHM in simple pendulum, floating cylinder, liquid in U-tube, oscillating springs (vertical and horizontal).<br/>iii) derives expressions to show that bodies execute SHM and</p> | <p>High</p> |



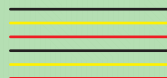
|  |  |                                                                                                                  |                                                                                                                                                                                                                                                                                 |        |
|--|--|------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|  |  |                                                                                                                  | <p>applies the equations to solve related numerical problems.</p> <p>iv) investigates the interchange of energy in SHM and derives expressions for energy conservation in SHM.</p> <p>v) Models devices that operate on the principle of SHM and describes their operation.</p> | Medium |
|  |  | <p>i) deduce that waves are a means of transferring energy and that this has many</p>                            | <p>i) describes the types and properties of waves and terminologies related to them.</p>                                                                                                                                                                                        |        |
|  |  | <p>a. describe and explain wave properties.</p> <p>b. investigate the behaviour of waves in different media.</p> |                                                                                                                                                                                                                                                                                 |        |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                              |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>applications (<math>u</math>, <math>s</math>, <math>g</math>s)</p> <p>ii) deduce that when waves interfere, they generate properties that have various applications in real life (<math>u</math>, <math>s</math>, <math>g</math>s, <math>v/a</math>)</p> <p>iii) explain concepts related to diffraction of waves and apply them to everyday life situations (<math>s</math>, <math>g</math>s, <math>v/a</math>)</p> <p>iv) examine the phenomenon of wave polarisation and how it applies to real life (<math>u</math>, <math>v/a</math>)</p> | <p>c. solve numerical problems using wave equation.</p> <p>d. draw and interpret wave diagrams and graphs.</p> <p>e. explore real life applications of progressive waves.</p> | <p>ii) derives equation for the displacement of a progressive wave and applies it in different situations.</p> <p>iii) explains the applications of Huygens' principle in a variety of situations.</p> <p>iv) Fabricates communication devices that use the concept of progressive waves.</p> <p>v) describes the interference of waves using Young's double slit experiment and other related concepts.</p> |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



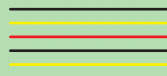
|  |  |  |                                                                                                                                                                                                                                             |        |
|--|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|  |  |  | vi) describes the concepts of diffraction and polarisation of light and their implications and applications in real life.<br>vii) describes the applications of polaroid and polarised light.                                               |        |
|  |  |  | i) describes the characteristics of stationary waves and how they are formed.<br>ii) derives the stationary wave equation and expressions of frequency for                                                                                  | Medium |
|  |  |  | a) describe characteristics of stationary waves.<br>b) investigate the formation of stationary waves in different media and their applications.<br>c) draw and explain features of graphs                                                   |        |
|  |  |  | i) analyse the behaviour of stationary waves, and the expressions that describe them ( $u$ , $s$ )<br>ii) deduce that stationary waves can be produced in pipes and strings for use in a variety of situations. ( $u$ , $s$ , $g$ , $v/a$ ) |        |

|  |                                                                                                        |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |                                                                                                        |                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                   |
|  | <p>iii) illustrate the concept of resonance of waves and its applications (<math>u, s, v/a</math>)</p> | <p>d) of a stationary wave.<br/>model systems that apply concept of stationary waves in pipes and strings.</p> | <p>iii) different harmonics and applies them.<br/>describes the formation of stationary waves in stretched strings and pipes and determines the end error correction.<br/>iv) models systems that apply the concept of stationary waves in pipes and strings.<br/>v) determines the speed of sound in air using the resonance tube method and analyses its suitability.<br/>vi) describes the applications of</p> |



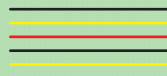
|                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                     |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                            | stationary waves in real life situations.                                                                                                                                                                                                                                                                           | Medium |
| <p>i) analyse beats, notes and octaves as applied in sound, and their implications in a variety of situations (u, s)</p> <p>ii) investigate doppler effect and how it applies to various fields (u, v/a)</p> | <p>a) explain the nature and properties of sound waves.</p> <p>b) apply wave equation to solve related numerical problems.</p> <p>c) investigate sound properties and measure speed in different media.</p> <p>d) analyse sound resonance, harmonics and their real-life applications.</p> | <p>vii) describes the production and propagation of sound and explains the terminologies involved.</p> <p>viii) explains the concept of doppler effect and its application to real life.</p> <p>ix) derives expression for beat frequency, doppler effect and applies them to solve related numerical problems.</p> | Medium |
| <p>i) apply the concept of electrostatics in production of charge</p>                                                                                                                                        | <p>a) describe the nature of electric charge</p>                                                                                                                                                                                                                                           | <p>i) describes the distribution of charge on different</p>                                                                                                                                                                                                                                                         | Medium |

|  |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p>in real-life situations (u, s, gs)</p> <p>ii) appreciate the existence of a force between charges and its implications (u, s, gs)</p> <p>iii) examine electric fields and their implications in various situations (u, s)</p> | <p>and charging methods.</p> <p>b) investigate the interaction between static charges and draw relevant graphs.</p> <p>c) investigate the behaviour of charges in insulators and conductors.</p> <p>d) apply derived equations to solve related numerical problems.</p> | <p>shapes of conductors.</p> <p>ii) explains corona discharge and its applications in real life situations.</p> <p>iii) explains the concept of electrostatic shielding and its significance.</p> <p>iv) models devices that employ electrostatics in their operation.</p> <p>v) demonstrates and explains the existence of force between charged bodies.</p> <p>vi) applies Coulomb's law in a variety of situations.</p> |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



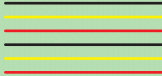
|  |  |  |                                                                                                                                                 |  |      |
|--|--|--|-------------------------------------------------------------------------------------------------------------------------------------------------|--|------|
|  |  |  | vii) explains the concepts of electric field intensity, E, electric field potential, V and how they vary in relation to distance from the body. |  | High |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |
|  |  |  |                                                                                                                                                 |  |      |

|  |                                        |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                             |  |
|--|----------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <p>real-life situations (u, s, gs)</p> | <p>d) model capacitors for use in various electronic devices.</p> | <p>iv) derives and applies the expressions for the effective capacitance of capacitors in series and parallel arrangements.<br/>v) models capacitors and applies them in making electrical and electronic devices.<br/>vi) describes the processes of charging and discharging capacitors and their applications.<br/>vii) derives expressions for the energy stored in a capacitor and</p> |  |
|--|----------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|



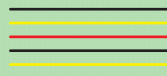
|                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------|
|                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                  | applies them in a variety of situations. | High |
| <p>i) deduce the relationship between current, resistance and voltage, and how they relate to transmission of charges in materials (u, s)</p> <p>ii) investigate the operation of slide wire meters and apply them in a variety of situations (s, gs, v, a)</p> | <p>a) explain the nature and properties of electric current.</p> <p>b) investigate the factors affecting current flow in an Ohmic conductor.</p> <p>c) derive and apply related equations.</p> <p>d) explain the use of resistors in the modification of galvanometers into ammeters and voltmeters.</p> <p>e) investigate power losses in transmission lines and safety measures.</p> | <p>i) Derives and applies expressions for effective resistance, electric energy and power in different circuits.</p> <p>ii) applies Kirchhoff's laws in resolving circuit networks.</p> <p>iii) sketches graphs for the variation of efficiency, power output and terminal p.d with load resistance and explains them.</p> <p>iv) describes the heating effect of current and its applications in explaining</p> |                                          |      |

|  |                                                                                                                                            |                                                                                                              |                                                                                                                                                                                                                                                                     |      |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  |                                                                                                                                            | f) draw and interpret related graphs.                                                                        | <p>temperature coefficient of resistance.</p> <p>v) describes the modification of galvanometers into ammeters and voltmeters and solves related numerical problems.</p> <p>vi) describes the mode of operation and applications of different slide wire meters.</p> |      |
|  | <p>i) deduce that the Earth has magnetic properties and this has many implications (u, s, gs) explain how magnetisation and</p> <p>ii)</p> | <p>a) explain magnetic properties of matter.</p> <p>b) draw and interpret magnetic field patterns around</p> | <p>i) draws magnetic field patterns around the earth and explains terminologies relating to the earth as a magnet.</p>                                                                                                                                              | High |



|  |                                               |                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                        |  |
|--|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |                                               |                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                        |  |
|  | <p>demagnetisation occur in matter (u, s)</p> | <p>conductors and the earth.</p> <p>c) investigate the interaction between electric current and magnetic fields.</p> <p>d) explore the behaviour of materials in magnetic fields.</p> <p>e) create models of magneto electric devices.</p> | <p>ii) determines values of the horizontal and vertical components of the Earth's magnetic field.</p> <p>iii) explains the concept of magnetic flux density and derives its expressions.</p> <p>iv) uses the domain theory used to explain magnetisation, demagnetisation and characteristics of magnetic materials.</p> <p>v) draws graphs showing the variation of magnetic flux</p> |  |

|  |                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                          |      |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  |                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                              | <p>density with magnetic field strength.</p> <p>vi) models devices that use magnetism in matter and describes their operation.</p>                                                                                                                                       |      |
|  |                                                                                                                                                                                                                                                                                                                                                                                                             | <p>a) describe the interaction between magnetic field and current carrying conductor.</p> <p>b) investigate factors affecting the magnitude and direction of the force.</p> <p>c) explain the principles behind electromagnetic devices.</p> | <p>vii) explains the existence of a magnetic field around current carrying conductors.</p> <p>viii) Derives expression for force on current carrying conductor and moving charge in a magnetic field.</p> <p>ix) interprets the expression for Biot-Savart's law and</p> | High |
|  | <p>i) investigate the existence of a force on a current-carrying conductor in a magnetic field (<math>u</math>, <math>s</math>, <math>gs</math>,)</p> <p>ii) use Biot Savart's law to write expressions for magnetic flux density in a variety of situations (<math>u</math>, <math>s</math>, <math>gs</math>)</p> <p>iii) explain how the force on a current-carrying conductor in a magnetic field is</p> |                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                          |      |

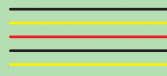


|                                                                       |                                                                      |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                 |               |
|-----------------------------------------------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
|                                                                       | <p>applied in the operation of various electrical devices (u, s)</p> | <p>d) derive expressions for force, torque hall voltage and solve related numerical problems.<br/>e) design and construct models of electromagnetic devices.</p> | <p>applies them in different situations.<br/>x) derives expression for the hall voltage and solves related numerical problems.<br/>xi) derives expression for the torque on a current carrying coil in a magnetic field and applies it in different situations.<br/>xii) models devices that apply the torque on a current carrying coil in a magnetic field and describes their operation.</p> |               |
| <p>i) explain the concept of electromagnetic induction and how it</p> |                                                                      | <p>a) explain the relationship between</p>                                                                                                                       | <p>i) derives expressions for the laws of electromagnetic induction and</p>                                                                                                                                                                                                                                                                                                                     | <p>Medium</p> |

|                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>is applied in a variety of situations (<math>u</math>, <math>s</math>, <math>gs</math>)</p> <p>ii) appreciate the concepts of self and mutual induction and their application in a variety of devices (<math>u</math>, <math>s</math>, <math>gs</math>)</p> | <p>magnetism and electric current.</p> <p>b) investigate the electromagnetic induction laws.</p> <p>c) describe the working principles of generators, motors and transformers.</p> <p>d) solve numerical problems using relevant equations on electromagnetic induction.</p> <p>e) model and simulate transformers, motors and generators.</p> | <p>applies them in different situations.</p> <p>ii) describes the mode of operation of generators, motors, and transformers.</p> <p>iii) derives expressions for self and mutual inductance and applies them in real life situations.</p> <p>iv) explains back emf and eddy currents in motors, derives expression for back emf, describes the applications of back emf and eddy currents.</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|  |  |                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                              |      |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  |  |                                                                                                                                                                                                                                             | v) models devices that employ the principle of electromagnetic induction.                                                                                                                                                                                                                                                    |      |
|  |  |                                                                                                                                                                                                                                             | <p>i) describes the inter-conversion of A.C and D.C and its implication.</p> <p>ii) describes the structure and mode of operation of A.C measuring instruments.</p> <p>iii) derives expressions for the r.m.s values of A.C and use them in solving numerical problems.</p>                                                  | High |
|  |  |                                                                                                                                                                                                                                             | <p>a) explain A.C and dc currents, their key quantities and other related terms.</p> <p>b) measure A.C using appropriate instruments.</p> <p>c) draw and interpret A.C waveforms.</p> <p>d) derive A.C formulae and calculate root mean square values.</p> <p>e) investigate the effects of A.C in different components.</p> |      |
|  |  | <p>i) explain the operation of A.C measuring devices and their various applications in real life (u, s)</p> <p>ii) evaluate the inductance, reactance and impedance of A.C circuits and their applications in real life (u, s, gs, v/a)</p> |                                                                                                                                                                                                                                                                                                                              |      |

|  |  |                                          |                                                                                                                                                                                                                                                                                                                            |  |
|--|--|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | <p>f) explore and model A.C devices.</p> | <p>iv) explains the behaviour of inductors and capacitors in A.C circuits.</p> <p>v) derives and applies expression for the inductive and capacitive reactance, impedance, average energy and power in A.C circuits.</p> <p>vi) draws and explains characteristic graphs for capacitors and inductors in A.C circuits.</p> |  |
|--|--|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

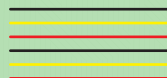


|  |  |                                                                                                                                                                                 |                                                                                                                                                                                                                                  |                                                                                                                                                                                                                          |
|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  |                                                                                                                                                                                 | vii) models electronic devices using capacitors, inductors and resistors and explains their mode of operation.                                                                                                                   |                                                                                                                                                                                                                          |
|  |  | i) examine the performance of semiconductor diodes in different devices (u, s, gs)<br>ii) analyse the operation and application of transistors in various situations (u, s, gs) | a) identify properties and functions of semi-conductor materials and logic components.<br>b) explain the components of electronic devices and basic logic gates.<br>c) analyse electronic circuits and logic gates combinations. | i) describes the different logic gates and constructs their truth tables.<br>ii) explains the operation of bi-stable switches and potential dividers.<br>iii) describes the behaviour of conductors, semi-conductors and |
|  |  |                                                                                                                                                                                 |                                                                                                                                                                                                                                  | Medium                                                                                                                                                                                                                   |

|  |  |                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                           |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <p>d) draw and interpret graphs of I- V characteristics.</p> <p>e) design analog and digital circuits for specific applications.</p> | <p>iv) insulators using the band theory.</p> <p>describes the production of n- and p- type materials and the operation of p-n diodes.</p> <p>v) explains the operation and the I- V characteristics of junction transistors and their applications.</p> <p>vi) derives expressions for the operations of junction transistors and their applications.</p> |
|--|--|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

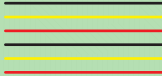
|                                                                              |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                 |                                                                                                                 |      |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------|
|                                                                              |                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                 | vii) models devices that employ diodes and junction transistors in their operations and explains how they work. |      |
| <b>Particles</b><br>Investigation of atomic, quantum, and nuclear phenomena. | <p>i) apply the Rutherford's scattering experiment to explain atomic structure (s, u)</p> <p>ii) examine the behaviour of charged particles and their applications in real life (u, s, gs)</p> | <p>i) describe the models of the atom.</p> <p>ii) measure the specific charge.</p> <p>iii) illustrate how atomic structure principles are used in different devices.</p> <p>iv) derive equations for the motion of electrons in electric and magnetic fields.</p> <p>v) assess the suitability of atomic applications in</p> | <p>i) describes Rutherford and Bohr's models of atoms.</p> <p>ii) explains the working principles of Millikan oil drop experiment and the mass spectrometer in determining specific charge.</p> |                                                                                                                 | High |

|                                                                                                                                                                                                                                                                                                                                                                        |  |                                |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                               |      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                                                                                                                                                                                                                                                                                                                                                        |  | technology and medical fields. | <p>a) explain the phenomena that demonstrate the particle nature of light.</p> <p>b) describe the wave particle duality for electromagnetic radiation.</p> <p>c) investigate photoelectric effect.</p> <p>d) apply Einstein's photo electric equation and uses it to solve numerical problems.</p> <p>e) draw and interpret graphs related to photoelectric effect.</p> <p>f) describe Compton effect as evidence</p> | <p>i) explains the production and characteristics of cathode and positive rays in CRT.</p> <p>ii) derives expressions for the motion of electrons in electric and magnetic fields.</p> <p>iii) describes and uses quantum theory to explain photoelectric emission.</p> <p>iv) describes the experiment to verify Einstein's law of photoelectric effect.</p> | High |
| <p>i) explain the process of photoelectric effect and its applications in real life (u, gs)</p> <p>ii) analyse Bohr's model and how it is used to explain atomic spectra of different elements (u, s, gs)</p> <p>iii) deduce that when fast moving electrons are stopped by matter, they produce energetic radiations which have many applications (u, s, gs, v/a)</p> |  |                                |                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                               |      |



|  |  |                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
|--|--|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  | <p>for the particle nature of light.<br/>g) discuss the applications of photo electric effect in real life situations.</p> | <p>v) derives and applies the expression for the kinetic energy of photo- electrons.<br/>vi) models devices that operate on the principle of photoelectric effect.<br/>vii) explains the origin and significance of absorption and emission spectra.<br/>viii) describes the uses and health hazards of X-rays.<br/>ix) derives expressions for the energy of x-rays, diffractions and applies the expressions.</p> |  |
|--|--|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |      |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|  | <p>i) appreciate that nuclear reactions generate energy which can be harnessed for different purposes (u, s, v/a)</p> <p>ii) deduce that nuclides disintegrate emitting particles and energy which have a variety of applications (u, s, gs, v/a)</p> | <p>a) explain the processes of nuclear fission and fusion and the large amounts of energy they release.</p> <p>b) draw and interpret graphs to study the variation of binding energy per nucleon with mass number and decay curves.</p> <p>c) derive expressions under nuclear energy and use them to solve numerical problems.</p> <p>d) differentiate between constructive and destructive uses of nuclear energy.</p> | <p>i) determines the binding energy per nucleon of the nucleus using appropriate expressions.</p> <p>ii) describes the variation of binding energy per nucleon with mass number and explains its significance.</p> <p>iii) calculates the mass defect and uses Einstein's energy relation to find the change in energy released during a nuclear process.</p> <p>iv) describes the merits and demerits of using nuclear energy in real life.</p> | High |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|



|  |  |  |                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|--|--|--|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  |  | <p>e) evaluate the ethical, political and economic implications of using nuclear technology.</p> | <p>v) explains the properties, dangers and applications of the products of radioactive decay.</p> <p>vi) derives expression of radioactive decay law and its application in different situations.</p> <p>vii) determines the half-life of radionuclides using a variety of methods.</p> <p>viii) explains the production of artificial isotopes and how they are used in a variety of situations.</p> |  |
|--|--|--|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

### 3. Structure of the Assessment Papers

There will be two assessment papers for Physics at Advanced Secondary Curriculum. Each assessment paper will be divided into different sections with each addressing an assessment objective. All the items will be scenario based.

**Paper 1** (Theory Paper) will contain four sections A, B, C and D. Section A will comprise of one item from construct four; Particles addressing assessment objective 4. Section B, C and D will comprise of two items each from constructs one; Force and Motion, construct two; Energy and construct three; Charges and Fields addressing assessment objective 1, 2 and 3 respectively. The learner will attempt a total of four items, including the one compulsory item from section A and one item from each of the sections B, C and D. The entire paper will take 2 hours and 40 minutes.

**Paper 2** (Practical Paper) will contain **two items**. Items in this paper will come from any of the four constructs. The items will assess practical abilities of the learners in the different constructs. The items in the paper will be scenario based and the entire paper will take 2 hours and 45 minutes (including time for reading, analysis of the scenario, planning and carrying out the investigation). A learner will attempt only **one item**.

#### Skills to be assessed:

- i) Planning to select techniques, apparatus and materials.
- ii) Identifying variables and controlling them.
- iii) Making predictions based on prior knowledge and hypotheses.
- iv) Manipulation of the apparatus and performing experiments to obtain readings/results.
- v) Making and recording observations and measurements to the right accuracy of instruments and calculation.
- vi) Presentation of data in an appropriate form, such as graphical and any other suitable form.
- vii) Manipulating graphical data by determining gradients, intercepts or any other required points and identifying patterns in outcomes.
- viii) Drawing conclusions from observations made.
- ix) Assessing the suitability of procedure by identifying errors, limitations of measurements and /or experimental procedures used and suggesting methods of minimising the errors for better results.

# Physics

## Paper I (Theory)

November 2025

**Time:** 2 hours 40 minutes

### UGANDA ADVANCED CERTIFICATE OF EDUCATION

#### SAMPLE EXAMINATION PAPER

#### PHYSICS

**Time:** 2 hours 40 minutes

#### INSTRUCTIONS TO CANDIDATES

- 1) This paper contains **seven (7)** items in all.
- 2) Attempt **four** items in total. Each question carries **20 marks**.
- 3) You must attempt **one item from each of the four sections**:
- 4) Section A is compulsory.
- 5) Use the provided data and support materials to guide your responses.
- 6) Clearly show all calculations and assumptions.

**SECTION A****Item 1**

The display screens of digital devices use Light Emitting Diodes (LEDs), which emit high amounts of blue light. Scientific research has shown that long exposure to such light is harmful to the human eyes. An ICT student of senior five in a certain school is worried that their eyes may be at a risk due to continuous use of computers.

**Support Material Provided:**

- i) Wavelength of blue light = 450 nm
- ii) Planck's constant,  $h = 6.63 \times 10^{-34}$  Js,
- iii) speed of light in vacuum,  $c = 3.0 \times 10^8$  m/s
- iv) Damage threshold for the human eye = 3.1 eV

**Tasks:**

- (a) Use the information provided to dispel fears of the student.
- (b) Explain to the student some of the symptoms of eye defects which can arise from prolonged exposure to radiations of energy beyond certain threshold.
- (c) Based on principles of Physics, suggest possible protective strategies which the student can employ to safeguard his/her eyes.

**SECTION B****Item 2**

In a hilly district in Uganda, a landslide buried part of a school compound during the rainy season. The Ministry of Education and Sports is seeking practical proposals from physics students to help schools in the district to construct retaining structures that can prevent future landslides effects in schools in the district and other districts prone to landslides.

**Support Material Provided:**

Slope inclination is  $45^\circ$ , mass of clay soil swept by rain is 3000 kg with density  $1,800 \text{ kg m}^{-3}$ . Rain increases soil mass by 25% and Coefficient of friction,  $\mu = 0.45$ .

**Tasks:**

- (a) With evidence, explain what happens when the soil gets saturated.
- (b) Propose with justification, the materials that can be used to construct a realistic vertical retaining structures in the district that can be used to protect the classrooms.

**Item 3**

Many rural areas experience frequent motorcycle accidents due to sharp curves and poor road design. Local council authorities seek physics-based input on safe road redesign.

**Support Material Provided:**

Radius of curved road = 12 m, Banking angle =  $5^\circ$ , Coefficients of friction: 0.6 (dry), 0.35 (wet). Mass of motorcycle + rider = 180 kg.

**Tasks:**

- (a) With justification, advise the local council on the maximum safe speed that the riders should move at, on such roads under wet and dry conditions.
- (b) Suppose that the curved road was not banked, provide convincing advice to the local council authorities, the design that would enable the motorcyclists reach their destinations earlier in both scenarios.

**SECTION C****Item 4**

Many rural households rely on firewood for cooking, leading to deforestation and health problems. In a bid to save our environment, the government recommended that alternative energy sources like solar be used.

In order to demonstrate to the community members, a solar cooker with Solar irradiance of  $800 \text{ W/m}^2$ , having cooking pot area of  $0.2 \text{ m}^2$  and efficiency of 35% is used to boil 2 kg of water from  $25^\circ\text{C}$  to  $100^\circ\text{C}$ .

The community members wondered how this technology works and how long it would take to boil the given mass of water.



**Tasks:**

- (a) Help the community members understand how the technology works and show to them how long it would take the water to boil.
- (b) Suggest design improvements, based on thermal principles, that can cause the water to boil in a shorter time than in (a) above.

**Item 5**

A new rural health center is built in a valley where mobile phone signals are weak. You are part of a student team challenged to design a communication system between the health center and a village watch tower located 150 meters away on a hill, in order to ease communication at the health centre. Hint: refractive indices of glass and air are 1.5 and 1.0, respectively.

**Tasks:**

- (a) Explain how communication occurs from the watch tower to the health centre through the medium identified.
- (b) Suggest practical **improvements** that the team can implement to increase clarity or strength of the signal at the health centre.

**SECTION D****Item 6**

Market vendors have over the years complained of destructive fire outbreaks caused by overloaded electric power extension cables. These fire outbreaks have often left market vendors devastated due to loss of property. To alleviate this situation, the chairman of the market vendors' association requested you, an A'level student of physics, to evaluate and recommend safer electrical practices.

During your evaluation, you find out that: the market is wired using an electrical cable of length 20m of resistance  $0.5 \Omega \text{ m}^{-1}$  carrying a current of 8A for a duration of 4 hours per day. Maximum safe energy dissipation by the cable is  $331.2 \text{ kJ m}^{-1}$ .

**Tasks:**

- (a) Analyse the information provided and suggest the cause of fire in the market.
- (b) Propose practical safety improvements and awareness strategies to the vendors to avoid such occurrence.

**Item 7**

A farming community bordering a game reserve regularly suffers crop destruction due to wild animals entering their fields at night. To address this challenge, they intend to develop a solar-powered electronic alarm system that uses a magnetic sensor to detect the motion of animals. They heard that such a system operates on alternating current (A.C) converted from solar energy. When activated, the system triggers a light-emitting diode (LED) to display the animal detection waveform on a Cathode Ray Oscilloscope (CRO), which has a Y-sensitivity of  $20 \text{ Vcm}^{-1}$  and the time base of 0.01 seconds, showing two full cycles of a 4 cm peak-to-peak sinusoidal waveform that generates a loud alarm.

**Tasks:**

You have been approached as a student of Physics:

- (a) Help the local community understand how the system works.
- (b) Design a circuit diagram showing how A.C from the solar inverter can be fully rectified to power the system.

**END**



# Physics

## Paper II (Practical)

November 2025

**Time:** 2 hours

**UGANDA ADVANCED CERTIFICATE OF EDUCATION  
SAMPLE EXAMINATION PAPER  
(PRACTICAL PAPER)**

**Time:** 2 hours

### INSTRUCTIONS TO CANDIDATES:

- 1) This paper contains **two** items
- 2) Attempt **only one** item
- 3) For each task:
  - i) Identify the problem or relationship and hypothesis to investigate.
  - ii) Design and carry out a valid experiment.
  - iii) Record and present your data clearly.
  - iv) Analyse your results and draw reasoned conclusions.
  - v) Reflect on accuracy of the results and suggest improvements.
- 4) Support materials for each task are provided.

### Item 1

A local boda-boda (motorcycle) garage is interested in improving the fuel efficiency and safety of motorcycles by reducing unnecessary load and friction. Mechanics often claim that heavier loads make motorcycles harder to accelerate, but they cannot quantify this effect. The garage consults physics students to investigate the above phenomenon using a trolley model.

### Task:

As a Physics student, you are required to conduct an experiment to reassure the mechanics about their claim.

**Item 2**

An electrician observes that a wire in a household circuit heats up significantly when current flows through it. He suspects that this wire may have an unusual electric behaviour and fears that it might cause fire and burn the house. He, therefore, wishes to replace the wire with another one, but has two alternatives to choose from.

**Task**

- (a) As a physics student, carry out an investigation to help the electrician to select the right wire for replacing the wire that heats up.
- (b) At a chosen value of voltage  $V$ , compare the power generated from each conductor and advise the electrician accordingly.

**END**

**ADVANCE INFORMATION FOR P510/2 PHYSICS PRACTICAL****Item 1**

- i) Trolley
- ii) A smooth runway
- iii) Light pulley
- iv) Slotted masses and a hanger (50-500 g)
- v) A string
- vi) A meter rule
- vii) A retort stand and a clamp
- viii) A stop clock/watch

**Item 2**

- i) DC power supply (adjustable voltage)
- ii) Ammeter and voltmeter (digital or analogue)
- iii) Conducting wires of different materials (e.g. copper, nichrome, constantan of known gauge)
- iv) Connecting wires
- v) Resistors of known values (labelled on them)
- vi) Switch
- vii) Rheostat (variable resistor)
- viii) Micrometer screw gauge or vernier caliper
- ix) Stopwatch (for timed heating trials)

## Scoring Rubrics for Physics Paper One (Theory Paper)

### Item 1

| Output / Task                                                         | Basis of Evaluation                               | Score                                                                                                                                     |                                                                                                                                 |                                                                                                                                |                                                                                                                                          |
|-----------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                       |                                                   | 4                                                                                                                                         | 3                                                                                                                               | 2                                                                                                                              | 1                                                                                                                                        |
| (a) Assessment likelihood of eye damage basing on energy of radiation | Correct formula, substitution, energy calculation | Formula correctly stated, quantities and constants substituted with correct SI units and defined, energy computed accurately in J and eV, | Formula correctly stated, constants substituted with correct SI units without defining, energy computed accurately in J and eV, | Formula correctly stated, constants substituted with correct SI units, energy computed accurately in J, fails to convert to eV | Incorrect formula stated, constants substituted correctly, but not in SI units, energy computed with errors in J, fails to convert to eV |
|                                                                       | Comparison to threshold                           | Correct comparison to threshold and conclusion made, basing on the calculated values                                                      | Correct comparison to threshold with inappropriate conclusion made in relation to the calculation                               | Correct comparison to threshold and no conclusion made.                                                                        | No comparison to threshold and only disconnected or conclusion is provided                                                               |

|                           |                              |                                                           |                                                       |                                                       |                                                       |
|---------------------------|------------------------------|-----------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| (b) Biological effects    | Identification & explanation | At least 5 valid symptoms clearly explained.              | Only 4 valid symptoms clearly explained               | Only 2 valid symptoms clearly explained.              | Only 1 valid symptom stated or irrelevant symptoms    |
| (c) Protective strategies | Suggestion & justification   | At least 5 valid strategies stated and clearly explained. | Only 4 valid strategies stated and clearly explained. | Only 2 valid strategies stated and clearly explained. | Only 1 valid strategy stated or irrelevant strategies |

## Item 2

| Output / Task                   | Basis of Evaluation                                                           | Score                                                                             |                                                                           |                                                           |                                                             |
|---------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------|-------------------------------------------------------------|
|                                 |                                                                               | 4                                                                                 | 3                                                                         | 2                                                         | 1                                                           |
| (a) Forces leading to landslide | Description of physical processes that take place when soil becomes saturated | States and accurately explains at least 4 valid processes in relation to the task | States and accurately explains 3 valid processes in relation to the task. | States and accurately explains at least 2 valid processes | States any 1 valid process or provides irrelevant processes |
|                                 | Calculation of the forces that                                                | Accurately calculates the forces leading to                                       | Accurately calculates the forces leading to                               | Calculates the forces leading to the land slide           | Fails to calculate the forces leading to the land slides,   |

|                                                                                               |                                                                             |                                                                                                  |                                                                                          |                                                                                             |                                                      |
|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------|
|                                                                                               | lead to land slides                                                         | the land slide, basing on correct formula, substitution, units and defining quantities           | the land slide, basing on correct formula, substitution, but makes minor errors on units | with minor errors like wrong resolution of forces and wrong units and fails to define units | but only tries to state some formulae or data to use |
| (b) Materials, their structural properties and structural adjustments to prevent soil sliding | Identification of structural properties of materials to prevent land slides | Identifies at least three materials and explains the structural properties for their suitability | Identifies two materials and explains the structural properties for their suitability    | Identifies one material and explains the structural properties for its suitability          | Only identifies materials without any explanation    |
|                                                                                               | Description of structural adjustments or how the materials will be used     | At least 5 valid adjustments stated and clearly explained                                        | Only 4-3 valid adjustments stated and clearly explained                                  | Only 2 valid adjustments stated and clearly explained                                       | One adjustment stated whether valid or irrelevant    |

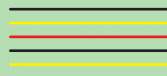
**Item 3**

| <b>Output / Task</b>                                        | <b>Basis of Evaluation</b>                                                 | <b>Score</b>                                                                                                                                                               |                                                                                                                                                                                                |                                                                                                                                                                                      |                                                                                                   |
|-------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
|                                                             |                                                                            | <b>4</b>                                                                                                                                                                   | <b>3</b>                                                                                                                                                                                       | <b>2</b>                                                                                                                                                                             | <b>1</b>                                                                                          |
| (a) Maximum Safe Speed Calculation (Dry and Wet Conditions) | Correct formula derivation and application; correct substitution of values | Correctly derives the expression for maximum speed for banked track with friction; Calculates accurately the maximum speed for both dry and wet conditions; with no errors | Correctly derives the expression for maximum speed for banked track with friction; Calculates the maximum speed for both dry and wet conditions with minor errors like wrong or missing units; | Uses the expression for maximum speed on banked track with friction to calculate the maximum speed for both dry and wet conditions; but makes major errors in substitution and units | Tries to calculate the maximum speed for both dry and wet conditions; using inappropriate formula |
|                                                             | Correct inferences or conclusions basing on the calculations               | Provides practically safe advice to the LC that is based on the calculated values                                                                                          | Provides practically safe advice to the LC that is not entirely based on the calculated values                                                                                                 | Provides practically safe advice to the LC, but fails to link the calculated values to the advice                                                                                    | Provides inaccurate safety advice to the LC and is not based on the calculated values             |

|                                                   |                                                                                       |                                                                                                                                                                      |                                                                                                                                                                                                         |                                                                                                                                                                         |                                                                                                                  |
|---------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <p>(b) Road Design Advice (Unbanked Scenario)</p> | <p>Proper derivation of the condition for unbanked roads</p>                          | <p>Correctly derives the expression for maximum speed for unbanked track with friction; Calculates accurately the maximum speed for both dry and wet conditions;</p> | <p>Correctly derives the expression for maximum speed for unbanked track with friction; Calculates the maximum speed for both dry and wet conditions with minor errors like wrong or missing units;</p> | <p>Uses the expression for maximum speed on unbanked track with friction to calculate the maximum speed for both dry and wet conditions using inappropriate formula</p> | <p>Tries to calculate the maximum speed for both dry and wet conditions using inappropriate formula</p>          |
|                                                   | <p>Proposal of redesign strategy based on physics principles and the calculations</p> | <p>Provides practically proposal to the LC basing on the derived expressions and calculation.</p>                                                                    | <p>Provides practically proposal to the LC but does not entirely link them to the derived expressions and calculation.</p>                                                                              | <p>Provides some safety advice to the LC, but fails to link them to the calculations</p>                                                                                | <p>Provides inaccurate safety advice to the LC and is not connected to the expressions and calculated values</p> |

**Item 4**

| Output / Task                 | Basis of Evaluation                                                      | Score                                                                                                                  |                                                                                                                                        |                                                                                                                    |                                                                                  |
|-------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                               |                                                                          | 4                                                                                                                      | 3                                                                                                                                      | 2                                                                                                                  | 1                                                                                |
| (a) Working of a solar heater | Steps in calculation of usable power and how long it takes to boil water | Correctly calculates energy required; determines usable power and computes boiling time accurately with correct units. | Correctly calculates energy required; determines usable power and computes boiling time accurately with minor errors in correct units. | Calculates energy required; determines usable power and computes boiling time with major errors in the quantities. | Tries to calculate energy required; and boiling time using inappropriate formula |
|                               | Understanding of solar heating principles                                | Identifies and explains at least four solar heating principles                                                         | Identifies and explains any three solar heating principles                                                                             | Identifies and explains any two solar heating principles                                                           | Mentions at least one principle, but does not provide any explanation            |
| (b) Design Improvements       | Suggests feasible improvements based on thermal principles               | Proposes at least five practical, physics-based improvements with clear justification                                  | Proposes any four practical, physics-based improvements with clear justification                                                       | Proposes any two practical, physics-based improvements with clear justification                                    | Proposes any improvement with or without any justification.                      |

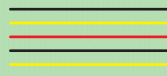


**Item 5**

| Output / Task                         | Basis of Evaluation                                   | Score                                                                                                                                                                                                    |                                                                                                                                                                                                          |                                                                                                                                                    |                                                                                                              |
|---------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
|                                       |                                                       | 4                                                                                                                                                                                                        | 3                                                                                                                                                                                                        | 2                                                                                                                                                  | 1                                                                                                            |
| (a) Explanation of Communication      | Understanding of light propagation through the medium | Provides a clear, accurate explanation with illustrations of optical communication processes, through free space and optical fibres with relevant mathematical backup like calculation of critical angle | Provides a clear, accurate explanation of optical communication processes, through free space and optical fibres with relevant mathematical backup like calculation of critical angle with minor errors. | Provides a clear, accurate explanation of optical communication processes, through free space and optical fibres with limited mathematical backup. | States optical communication processes, through either free space and/or optical fibres in an incoherent way |
| (b) Practical Improvement Suggestions | Feasibility and physics reasoning                     | Proposes at least five realistic, physics-based suggestions with clear justification for each of free space and optical fibres.                                                                          | Proposes any four realistic, physics-based suggestions with clear justification for each of free space and optical fibres.                                                                               | Proposes any two realistic, physics-based suggestions with clear justification for each of free space and optical fibres.                          | Proposes any one justification for either free space or optical fibres in an incoherent manner               |

**Item 6**

| Output / Task                      | Basis of Evaluation                                                                   | Score                                                                                                                                                      |                                                                                                                                                                     |                                                                                                                               |                                                                                             |
|------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
|                                    |                                                                                       | 4                                                                                                                                                          | 3                                                                                                                                                                   | 2                                                                                                                             | 1                                                                                           |
| (a) Analysis of fire cause         | Correct calculation of energy dissipation                                             | Correctly calculates energy dissipation using appropriate formula and units and compares with the safe limits;                                             | Correctly calculates energy dissipation with minor errors like missing units and compares with the safe limits;                                                     | Calculates energy dissipation with major errors like missing units and incorrect substitution, compares with the safe limits; | Attempts to calculate the energy dissipation, but can identify just a few relevant formulae |
|                                    | Correct identification of electrical overload and reasoning basing on calculated data | Clearly explains the cause of fire in relation to energy dissipation<br>Correctly applies obtained results and energy concepts to make a valid conclusion. | Clearly explains the cause of fire in relation to calculated values of energy<br>Correctly applies obtained results and energy concepts to make a valid conclusion. | Explains the cause of fire;<br>Fails to apply obtained results and energy concepts to make a conclusion.                      | Explains the cause of fire without referring to any calculation                             |
| (b) Safety Improvement Suggestions | Practical and feasible measures                                                       | Proposes at least five realistic measures with clear physics justification                                                                                 | Proposes any four realistic measures with clear physics justification                                                                                               | Proposes any one realistic measures with justification.                                                                       | Proposes some measures without any or with false justification.                             |



**Item 7**

| Output / Task                       | Basis of Evaluation                                               | Score                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                      |                                                                                                                                                                           |
|-------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                     |                                                                   | 4                                                                                                                                                                                                                                                                                | 3                                                                                                                                                                                                                                                                        | 2                                                                                                                                                                                                                                                    | 1                                                                                                                                                                         |
| (a) Explanation of System Operation | Understanding of solar-powered magnetic detection and CRO display | Clear, accurate and coherent explanation of how solar energy is converted to electrical A.C, how the magnetic sensor detects motion, and how the LED/CRO displays the waveform; Correctly explains induced voltage, current flow, and signal display with well labeled diagrams; | Clear, accurate explanation of how solar energy is converted to electrical A.C, how the magnetic sensor detects motion, and how the LED/CRO displays the waveform; Correctly explains induced voltage, current flow, and signal display with partially labeled diagrams. | Incoherently explains how solar energy is converted to electrical A.C, how the magnetic sensor detects motion, and how the LED/CRO displays the waveform; Explains induced voltage, current flow, and signal display without fully labeled diagrams. | States how solar energy is converted to electrical A.C; States how the magnetic sensor detects motion, and how the LED/CRO displays the waveform without any explanations |
| (b) Rectification Diagram           | Completeness, accuracy, and clarity of                            | Draws a completely labeled diagram                                                                                                                                                                                                                                               | Draws a labeled diagram showing full-wave rectification but                                                                                                                                                                                                              | Draws a labeled diagram showing full-wave                                                                                                                                                                                                            | Draws a diagram showing rectification;                                                                                                                                    |

|  |                                       |                                                                                                     |                                                                                               |                                                                                               |                                                            |
|--|---------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------|
|  | schematic full wave rectification     | showing full-wave rectification;                                                                    | with some minor omissions                                                                     | rectification with major omissions                                                            | which is inappropriate                                     |
|  | Correct explanation of the components | Correctly explains the function of at least 6 labeled components to ensure full wave rectification. | Correctly explains the function of any 4 labeled components to ensure full wave rectification | Correctly explains the function of any 2 labeled components to ensure full wave rectification | Tries to explain the function of any one labeled component |

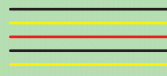
**END**

## Scoring Rubric for Advanced Level Physics Paper Two (Practical) Assessment

### Item 1

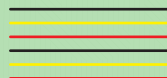
| Output / Task               | Basis of Evaluation              | Score                                                                                              |                                                                                                    |                                                                                       |                                                |
|-----------------------------|----------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------|
|                             |                                  | 4                                                                                                  | 3                                                                                                  | 2                                                                                     | 1                                              |
| <b>Aim</b>                  | Clarity and relevance of the aim | Clear, concise, and fully relevant aim linked to investigation relating mass to acceleration.      | Mostly clear and relevant aim linked to investigation relating mass to acceleration                | Relevant aim linked to investigation relating mass to acceleration                    | Aim has little or no link to the investigation |
| <b>Hypothesis</b>           | Appropriateness and testability  | Well-stated, testable hypothesis; clearly predicts the relationship between mass and acceleration. | Relevant and testable hypothesis; clearly predicts the relationship between mass and acceleration. | Partially stated hypothesis to predict the relationship between mass and acceleration | Irrelevant or no hypothesis stated             |
| <b>Independent Variable</b> | Correct identification           | Correctly identifies and accurately explains the independent variables                             | Correctly identifies and partially explains the independent variables                              | Correctly identifies the independent variables without explanation                    | Variables not distinguished                    |

| <b>Dependent Variable</b>   | Correct identification                  | Correctly identifies and accurately explains the dependent variables.                                                            | Correctly identifies and partially explains the dependent variables.                                                     | Partially identifies the dependent variables without explanation                         | Variables not distinguished                                                                                    |
|-----------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Controlled Variables</b> | Completeness and correctness            | Correctly identifies and accurately explains the controlled variables                                                            | Correctly identifies and partially explains the controlled variables                                                     | Partially identifies the controlled variables without explanation                        | Controlled Variables not distinguished                                                                         |
| <b>Procedure</b>            | Clarity, completeness, logical sequence | Clear, concise, replicable and fully relevant step-by-step procedure establishing the relationship between mass and acceleration | Clear, replicable and fully relevant step-by-step procedure establishing the relationship between mass and acceleration. | Partially relevant procedure establishing the relationship between mass and acceleration | Totally illogical procedure which does not lead to establishing the relationship between mass and acceleration |



| <b>Data Presentation</b>         | Organisation, tables, units    | Data presented clearly in correct columnar table with units and labels indicated; measurements recorded to the accuracy of the instrument used with no errors in units. | Data presented clearly in correct columnar table with some errors in units and labels; measurements recorded to the accuracy of the instrument used. | Data presented in an incomplete table with major errors in units and labels; measurements recorded inconsistently. | Totally illogical data with no trends presented                |
|----------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| <b>Errors and Precautions</b>    | Identification and explanation | Accurately identifies errors; accurately explains their sources and proposes appropriate precautions                                                                    | Accurately identifies errors; partially explain their sources and proposes appropriate precautions.                                                  | Identifies some errors and suggests inappropriate precautions                                                      | Irrelevant sources of errors and precautions stated            |
| <b>Data Analysis (Graphical)</b> | Accuracy, interpretation       | Title clearly stated; axes drawn and labeled with appropriate units; Appropriate scale;                                                                                 | Title clearly stated; axes drawn and labeled with missing units; missing units;                                                                      | Title stated; errors in labeling axes with missing units; inappropriate scale; points                              | Irrelevant analysis of data, like plotting wrong graph without |

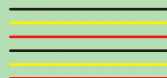
| <b>Conclusion/Recommendation</b> | Justification using physics principles | points correctly plotted; trend analysed accurately                                                                              | Appropriate scale; points correctly plotted; trend analysed accurately.                                           | plotted; trend analysed.                                                                        | clear scales and no units in labeling                                      |
|----------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
|                                  |                                        |                                                                                                                                  |                                                                                                                   |                                                                                                 |                                                                            |
|                                  | Justification using physics principles | Accurate, logical conclusion, fully justifying the investigation carried out; recommendations appropriate basing on the results. | Clear, logical conclusion, fully justifying the investigation carried out; recommendations basing on the results. | Makes a conclusion partly justifying the investigation carried out with partial recommendation. | Irrelevant conclusion or incorrect recommendation in relation to the data. |



**Item 2**

| Output / Task               | Basis of Evaluation              | Score                                                                               |                                                                         |                                                                                                |                                                |
|-----------------------------|----------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------|
|                             |                                  | 4                                                                                   | 3                                                                       | 2                                                                                              | 1                                              |
| <b>Aim</b>                  | Clarity and relevance of the aim | Clear, concise, and fully relevant aim linked to investigation relating I to V.     | Mostly clear and relevant aim linked to investigation relating I to V.  | Relevant aim linked to investigation relating I to V                                           | Aim has little or no link to the investigation |
| <b>Hypothesis</b>           | Appropriateness and testability  | Well-stated, testable hypothesis; clearly predicts the relationship between I to V. | Partially stated hypothesis to predict the relationship between I to V. | Unclear hypothesis stated that does not lead to prediction of the relationship between I to V. | Irrelevant or no hypothesis stated             |
| <b>Independent Variable</b> | Correct identification           | Correctly identifies and accurately explains the independent variables.             | Correctly identifies and partially explains the independent variables.  | Partially identifies the independent variables without explanation                             | Variables not identified and distinguished     |

|                             |                                         |                                                                                                                    |                                                                                                           |                                                                            |                                                                                                  |
|-----------------------------|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Dependent Variable</b>   | Correct identification                  | Correctly identifies and accurately explains the dependent variables.                                              | Correctly identifies and partially explains the dependent variables                                       | Partially identifies the dependent variables without explanation           | Variables not identified and distinguished                                                       |
| <b>Controlled Variables</b> | Completeness and correctness            | Correctly identifies and accurately explains the controlled variables.                                             | Correctly identifies and partially explains the controlled variables.                                     | Partially identifies the controlled variables without explanation          | Controlled Variables not distinguished                                                           |
| <b>Procedure</b>            | Clarity, completeness, logical sequence | Clear, concise, replicable and fully relevant step-by-step procedure establishing the relationship between I to V. | Clear, replicable and fully relevant step-by-step procedure establishing the relationship between I to V. | Partially relevant procedure establishing the relationship between I to V. | Totally illogical procedure which does not lead to establishing the relationship between I to V. |
| <b>Data Presentation</b>    | Organisation, tables, units             | Data presented clearly in correct columnar table                                                                   | Data presented                                                                                            | Data presented in an                                                       | Totally illogical data presented,                                                                |



|                               |                                |                                                                                                      |                                                                                                                                       |                                                                                                |                                                                  |
|-------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                               |                                | with units and labels indicated; measurements recorded to the accuracy of the instrument used.       | clearly in correct columnar table with some errors in units and labels; measurements recorded to the accuracy of the instrument used. | incomplete table with major errors in units and labels; measurements recorded inconsistently . | improper or missing units and with no trends in the measurements |
| <b>Errors and Precautions</b> | Identification and explanation | Accurately identifies errors; accurately explains their sources and proposes appropriate precautions | Accurately identifies errors; partially explain their sources and proposes appropriate precautions                                    | Identifies some errors and suggests inappropriate precautions .                                | Irrelevant errors identified and precautions stated              |

|                                  |                                        |                                                                                                                                  |                                                                                                                                          |                                                                                                    |                                                                                        |
|----------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| <b>Data Analysis (Graphical)</b> | Accuracy, interpretation               | Title clearly stated; axes drawn and labeled; Appropriate scale; points correctly plotted; trend analyzed accurately.            | Title clearly stated; axes drawn and labeled with missing units; appropriate scale; points correctly plotted; trend analysed accurately. | Major errors in either axes labels, finding the scale, plotting, or analysing trends               | Irrelevant analysis of data, like plotting wrong graph with inappropriate or no scales |
| <b>Conclusion/Recommendation</b> | Justification using physics principles | Accurate, logical conclusion, fully justifying the investigation carried out; recommendations appropriate basing on the results. | Makes a conclusion partly justifying the investigation carried out with partial recommendation                                           | Makes a conclusion that hardly justifies the investigation carried out with missing recommendation | Irrelevant conclusion or incorrect recommendation                                      |

## 4. Performance Level Descriptors

The overall descriptors for each construct are indicated in the tables below.

### Construct 1:

| Construct                                                                                                                                                                                  | Performance Level | Descriptor                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Forces and Motion</b><br><br>To investigate how forces affect motion and structures, and uses this knowledge to design safe, efficient, and practical solutions in everyday situations. | Exceptional       | Investigates and analyses complex force-motion interactions; accurately interprets data to make logical inferences and designs innovative, efficient, and safe mechanical or structural solutions for real-life challenges. |
|                                                                                                                                                                                            | Outstanding       | Effectively investigates how forces affect motion and structures; applies correct concepts to develop appropriate innovations, efficient solutions with minimal errors.                                                     |
|                                                                                                                                                                                            | Satisfactory      | Investigates straightforward interactions of forces and motion; applies known methods to suggest workable solutions with some innovations.                                                                                  |
|                                                                                                                                                                                            | Basic             | Identifies simple force-motion situations with limited interpretation; shows partial understanding and limited ability to relate knowledge to practical or experimental examples.                                           |
|                                                                                                                                                                                            | Elementary        | Shows limited identification or application of force and motion interaction in real life situations.                                                                                                                        |

**Construct 2:**

| CONSTRUCT                                                                                                                                                                                                                                                                | PERFORMANCE LEVEL | DESCRIPTOR                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Energy Transfer and Transformation</b><br><br>To investigate how energy is transferred and transformed through heat, light, sound, and waves, and applies this understanding to design, use, and explain devices and systems in daily life, industry, and technology. | Exceptional       | Analyses energy data in a variety of situations to make informed decisions and innovates or models complex systems of energy transfer with precision; explains, evaluates, and optimises technological devices for efficiency. |
|                                                                                                                                                                                                                                                                          | Outstanding       | Investigates and explains multiple forms of energy transformations; applies principles effectively to innovatively design or improve devices with sound reasoning.                                                             |
|                                                                                                                                                                                                                                                                          | Satisfactory      | Demonstrates understanding of common energy conversions; correctly designs with minimal errors, describes or operates simple devices.                                                                                          |
|                                                                                                                                                                                                                                                                          | Basic             | Recognises simple forms of energy transfer; states incomplete or partly correct innovative designs and explanations of simple device operation.                                                                                |
|                                                                                                                                                                                                                                                                          | Elementary        | Shows minimal awareness of energy concepts; unable to design, describe or demonstrate energy transfer in simple devices.                                                                                                       |

**Construct 3:**

| CONSTRUCT                                                                                                   | PERFORMANCE LEVEL | DESCRIPTOR                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electricity and Magnetism</b><br><br>To explore how electric and magnetic fields interact in systems and | Exceptional       | Demonstrates comprehensive understanding of electric and magnetic field interactions; innovatively models, analyses, and predicts behaviour of complex systems and technologies. |
|                                                                                                             | Outstanding       | Accurately applies principles of electricity and magnetism to explain and innovatively model common devices (motors,                                                             |

|                                                                                                                                                                   |              |                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| devices, and uses this understanding to explain and model technologies for power transmission, energy storage, and electronic control in daily life and industry. |              | transformers, generators) with minimal errors.                                                                                                                                       |
|                                                                                                                                                                   | Satisfactory | Understands core concepts of electricity and magnetism; can innovatively design, describe and test basic electrical or magnetic systems.                                             |
|                                                                                                                                                                   | Basic        | Shows partial understanding of electricity and magnetism principles; struggles to connect theory to practical devices or applications.                                               |
|                                                                                                                                                                   | Elementary   | Has very little understanding of electricity or magnetism principles or their interactions; cannot describe or design basic electrical or magnetic systems, only states basic facts. |

#### Construct 4:

| CONSTRUCT                                                                                                                                                                                                                                   | PERFORMANCE LEVEL | DESCRIPTOR                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Atomic, Quantum, and Nuclear Phenomena</b><br><br>To investigate atomic, quantum, and nuclear phenomena, and uses this understanding to explain how modern technologies work and to assess the benefits and risks of their applications. | Exceptional       | Integrates advanced understanding of atomic, quantum, and nuclear physics to explain and critically evaluate modern technologies and their social or environmental impacts. |
|                                                                                                                                                                                                                                             | Outstanding       | Accurately explains and applies key principles of atomic and nuclear physics to interpret technological applications, showing analytical insight.                           |
|                                                                                                                                                                                                                                             | Satisfactory      | Describes essential atomic and nuclear concepts and relates them to simple real-world technologies (e.g., X-rays, radioactivity) with minimal errors.                       |
|                                                                                                                                                                                                                                             | Basic             | Recognises a few atomic and nuclear principles and gives incomplete or inaccurate explanations of phenomena or applications.                                                |
|                                                                                                                                                                                                                                             | Elementary        | Shows limited understanding of atomic and nuclear concepts; partially or incorrectly relates them to modern technology applications.                                        |

The overall descriptors for the practical abilities.

| Construct                                                                             | Performance Level | Descriptor                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Practical abilities</b><br><br>To carry out investigations in different situations | Exceptional       | Clearly identifies the aim and makes testable hypotheses, controls variables and records observations appropriately, analyses data correctly, describes trends and appropriately proposes recommendations for improvements                                                         |
|                                                                                       | Outstanding       | Clearly identifies the aim and makes testable hypotheses, controls variables and records observations appropriately, analyses data correctly, describes trends and inappropriately proposes recommendations for improvements                                                       |
|                                                                                       | Satisfactory      | Partially identifies the aim and inappropriately states hypotheses, controls variables and records observations with minor errors in units, analyses data correctly, partially describes trends and inappropriately proposes recommendations for improvements                      |
|                                                                                       | Basic             | Partially identifies the aim and inappropriately states hypotheses, cannot distinguish variables and records observations with major errors in units and accuracy, incorrectly analyses data, partially describes trends and incorrectly proposes recommendations for improvements |
|                                                                                       | Elementary        | Fails to identify the aim and inappropriately states hypotheses, cannot distinguish variables and records observations with major errors in units and accuracy, incorrectly analyses data, fails to describe and make recommendations for improvements                             |



## CONTACT US:



National Curriculum Development Centre  
Plot M838, Kyambogo.  
P.O.Box 7002 Kampala, Uganda  
+256-393-112-088  
[www.ncdc.go.ug](http://www.ncdc.go.ug)



ISBN 978-9970-494-64-4



9 789970 494644