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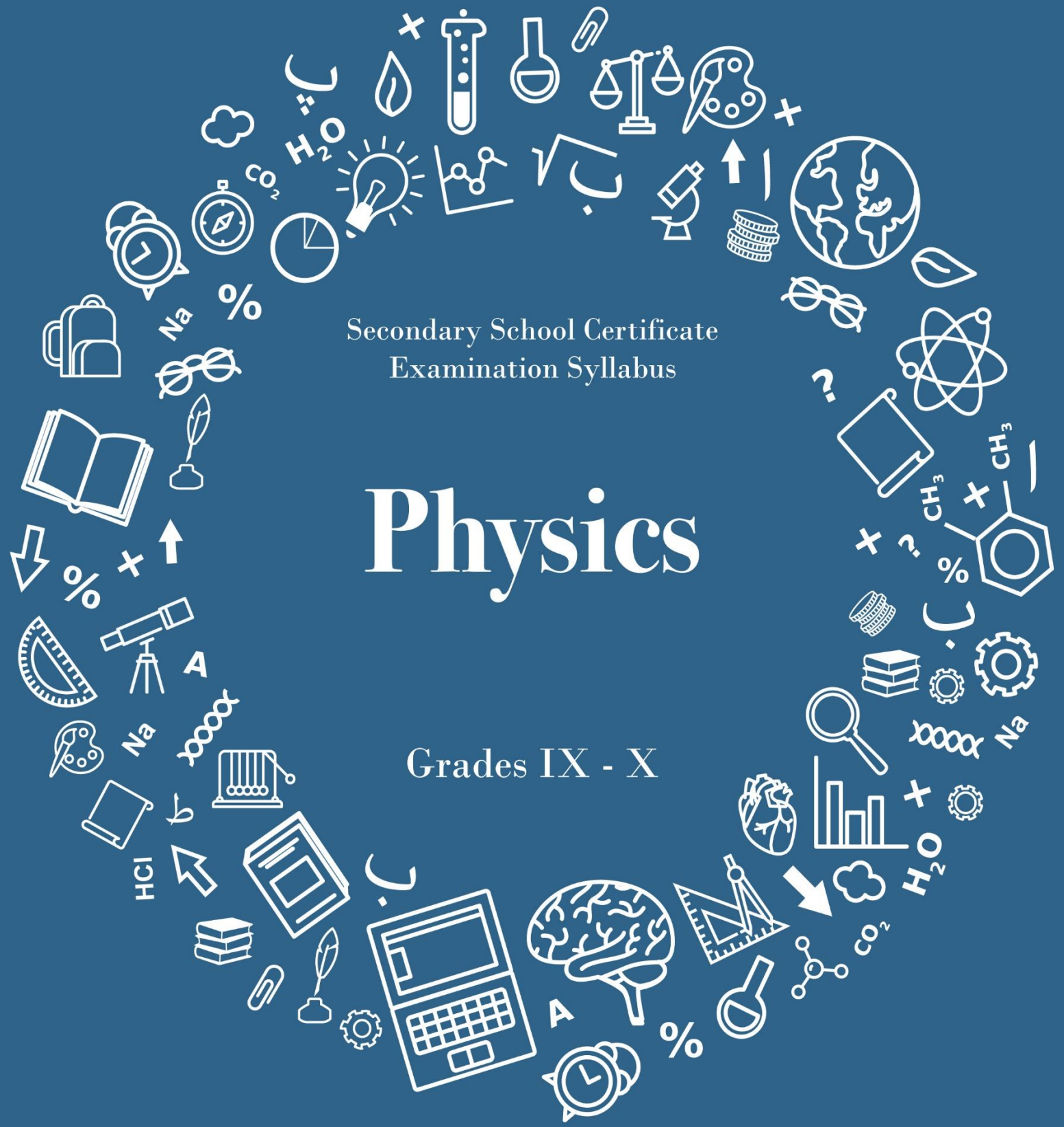
AGA KHAN UNIVERSITY EXAMINATION BOARD



Secondary School Certificate
Examination Syllabus

Physics

Grades IX - X

(Based on New National Curriculum 2022-2023)

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Secondary School Certificate Examination Syllabus

PHYSICS

GRADES IX-X

This syllabus will be examined in both Annual and September Examination sessions from Annual Examinations 2026 for Grade IX and Annual Examinations 2027 for Grade X

For queries and feedback

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Preface

Established in 2002 through the Pakistan government's ordinance, the Aga Khan University Examination Board (AKU-EB) is country's first private autonomous qualification awarding body for Secondary School Certificate (SSC) and Higher Secondary School Certificate (HSSC). Its vision is to be a model of excellence and innovation in education in Pakistan and the developing world.

AKU-EB achieves its vision by developing examination syllabi which inculcate conceptual thinking and higher-order learning and is aligned with the National Curriculum and mapped with provincial curricula and international standards. AKU-EB revises its syllabi periodically to support the needs of students, teachers and society.

The aims of the syllabus review of SSC and HSSC are to:

- Ensure continued compatibility with the goals of the National Curriculum of Pakistan.
- Review the content for inclusion of new knowledge and deletion of obsolete knowledge.
- Review the content for clarity and relevance as per the changing needs of students, teachers and society.
- Enhance and strengthen continuation and progression of content both within and across grades IX - XII (SSC and HSSC).
- Ensure the readiness of students for higher education.

During the syllabus review, the needs of all the stakeholders were identified through a needs-assessment survey. Students and teachers of AKU-EB affiliated schools from across Pakistan participated in the survey. Thereafter, a revision panel, which consisted of examiners, teachers of affiliated and non-affiliated schools, teacher trainers and university academicians, reviewed and revised the syllabus following a planned, meticulous and standardised syllabi review process.

The development of the revised syllabus has been made possible by the creativity and relentless hard work of the Curriculum and Examination Development unit and the constant support provided by all the other units of AKU-EB. We are particularly thankful to our Principal Syllabus Reviewers, Syllabus Revision Panellists and all other reviewers for their contribution. We are also thankful to all the students and teachers who took part in the needs assessment survey and to the principals of AKU-EB affiliated schools who made this endeavour possible by facilitating and encouraging their teachers and students to be a part of the survey and the syllabus revision panel.

With your support and collective hard work, AKU-EB has been able to take the necessary steps to ensure effective implementation of the National Curriculum of Pakistan through this syllabus. We are confident that this syllabus will continue to provide the support that is needed by students to progress to the next level of education and we wish the very best to our students and teachers in implementing this syllabus.

Dr Naveed Yousuf
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Understanding of AKU-EB Syllabi

1. The AKU-EB syllabi guide the students, teachers, parents and other stakeholders regarding the topics that will be taught and examined in each grade (IX, X, XI and XII). In each syllabus document, the content progresses from simple to complex, thereby, facilitating a gradual, conceptual learning of the content.

2. The topics of the syllabi are divided into Sub-Topics and **student learning outcomes** (**SLOs**). The SLOs define the depth and the breadth at which each topic or subtopic will be taught, learnt and examined. The syllabi also provide enabling SLOs where needed to scaffold student learning.

3. Each SLO starts with an achievable and assessable **command word** such as describe, relate, evaluate, etc. The purpose of the command words is to direct the attention of teachers and students to specific tasks that the students are expected to undertake during their studies.

4. The SLOs are classified under the following cognitive levels of Bloom's Taxonomy: Remember (R), Understand (U), Apply and beyond [Apply (A), Analyse (An), Evaluate (E), Create (C)]. This is to facilitate effective planning for teaching, learning and assessment. In addition, some SLOs are identified as Formative Assessments (FA), where applicable.

5. Where applicable, **Practical Activities** section is provided to elaborate the assessment in the Practical Examination.

6. The **Examination Specification** is provided which elucidates the weightage of each topic in the examinations determined based on the content as well as the relevance of the topic.

7. To implement this syllabus, students and teachers can take support from additional material provided by the board to its affiliated schools including **Learning Resource Guides**, **Pacing Guides** and **Model Papers**.

8. The AKU-EB syllabi for Secondary School Certificate (SSC) and Higher Secondary School Certificate (HSSC) are designed to foster not only conceptual understanding but also critical thinking and problem-solving skills. These syllabi ensure students develop the cognitive, affective and psychomotor skills essential for success at the university and beyond.

Subject Rationale of AKU-EB Physics

Why study Physics?

Physics is a fundamental science that explores the nature of matter, energy, and the universe. It provides answers to basic questions about how the world works. By studying physics at the SSC level, you will:

1. **Understand Natural Phenomena:** Learn how everyday occurrences, such as the motion of objects, electricity, magnetism, heat, and light, occur according to specific physical laws.

2. **Develop Critical Thinking Skills:** Physics encourages logical thinking and problem-solving. You will learn to analyse situations, identify solutions, and make decisions based on evidence.

3. **Lay the Foundation for Future Studies:** Physics is essential for students who want to pursue careers in engineering, medicine, environmental sciences, or technology. It provides a strong base for further studies in various scientific discipline.

4. **Improve Practical Skills:** Through experiments and activities, physics helps you develop observation, experimentation, and measurement skills, which are valuable in everyday life.

5. **Contribute to Technological Advancements:** Physics is the backbone of many technological innovations that we use every day, from smartphones to energy-efficient devices. Understanding physics enables you to contribute to and appreciate these advancements.

Physics is not just a subject but a way of understanding the world and solving real-world problems. Whether exploring the cosmos or understanding the smallest particles, physics will inspire curiosity and equip you with tools to make sense of the world.

What will you learn in the AKU-EB Physics?

Physics is a fundamental branch of experimental sciences as it studies everything from the very smallest particles of matter, such as quarks and leptons, to the vast distances between millions and billions of galaxies and the Milky Ways. Through a systematic study of the smallest and the largest phenomena, and everything in between, physics uncovers what is currently known about regarding matter and energy, while also opening doors for explore the yet unknown realms.

As Physics is based on both theoretical and as well as a practical approaches, therefore, learners in this subject have the opportunity to design, construct, investigate, collect and interpret meaningful data, analyse their findings and communicate results. These investigations can take place both inside and outside the laboratory.

Physics combines content, methodology and cognitive skill which enhances the learner's abilities to think conceptually and critically, and to solve real-life problems.

Where will it take you?

After studying AKU-EB Physics, students will be able to pursue the following career fields:

- Electronic Engineering
- Civil Engineering
- Electrical Engineering
- Petroleum Engineering
- Renewable Energy
- Medical Physics
- Geophysics
- Astrophysics
- Mechanical Engineering
- Software Engineering
- Automobile Engineering
- Textile Engineering

And many other related fields

How to approach the syllabus?

The AKU-EB syllabi is carefully designed with a reader-friendly approach to ensure that students and teachers can easily comprehend it, making it functional for teaching, learning and assessment purposes. The syllabus includes following parts:

Subject Rationale	It is an introductory document for students.
Student Learning Outcomes (SLOs)	These guides students about what must be achieved
Exam Specification	It guides regarding what is expected in the examination.
Practical Activities	These includes laboratory activities to be performed during an academic year.
Additional Resources:	
Pacing Guide	It ensures smooth transition and curricular continuity of a school's academic year. It also predicts the time and pace of syllabus implementation.
Resource Guide	It includes teaching and learning resources for students and teachers.
Model Paper	It guides regarding exam pattern, types of questions and marking scheme.
Command Word Guide	It clarifies expectations regarding the cognitive levels and skills that should be acquired by the students and which are assessed in its examinations.

Student Learning Outcomes of AKU-EB SSC Physics Syllabus

Part I (Grade IX)

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level[1]		
				R	U	A and beyond
1. Measurement		Students should be able to:				
1.1	Physical Quantities	1.1.1	differentiate between physical and non-physical quantities;		*	
		1.1.2	exemplify that physics is based on physical quantities only;		*	
		1.1.3	identify various physical quantities as base and derive quantities;		*	
1.2	The International System (SI) of Units	1.2.1	list the seven base quantities of International System (SI) along with their symbols and units;	*		
		1.2.2	differentiate between base and derived physical quantities and units;		*	
1.3	Scientific Notation	1.3.1	convert prefixes and their symbols to indicate multiples and sub-multiples for base and derived units;			A
		1.3.2	convert numerical values of measurement in scientific notation;			A
1.4	Scalars and Vectors	1.4.1	differentiate between scalar and vector quantities;		*	
		1.4.2	list out various physical quantities as scalar or vector;	*		
		1.4.3	describe the 'head to tail' rule of vector addition;		*	
		1.4.4	determine, using Pythagoras theorem and graphs, the resultant of two vectors at right angle;			A

[1]R = Remember, U = Understand, A = Apply and beyond [Apply (A), Analyse (An), Evaluate (E), Create (C)]

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
1.5	Measuring Instruments • Measuring cylinder • Measuring tape • Meter rule • Physical/ Electronic balance • Screw gauge • Spring balance • Stopwatch • Vernier callipers	1.5.1 1.5.2 1.5.3 1.5.4	identify measuring instruments; determine the least count (LC) of the measuring instruments; describe the working of measuring instruments; determine an average value of the measurement by measuring multiples values of the quantity;		* * 	 A A
1.6	Error and Accuracy	1.6.1 1.6.2	identify sources of errors (systematic and random) in the measurement; differentiate between precision and accuracy;		* *	
1.7	Significant Figures	1.7.1 1.7.2	describe significant figures; apply the rules for rounding a number to the appropriate number of significant figures.		*	 A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
2. Kinematics		Students should be able to:				
2.1	Rest and Motion	2.1.1	define rest and motion;	*		
2.2	Types of Motion	2.2.1	differentiate among the different types of motion, i.e., translatory (linear, random, circular), rotatory and vibratory motion;		*	
2.3	Terms Associated with Motion	2.3.1	define the following terms: a. distance, b. displacement, c. speed, d. velocity, e. acceleration;	*		
		2.3.2	calculate average speed, average velocity and acceleration;			A
		2.3.3	differentiate between: a. distance and displacement, b. speed and velocity, c. average speed and instantaneous speed, d. uniform and non-uniform velocity, e. uniform and non-uniform acceleration;		*	
		2.3.4	describe the universal speed limit of any object in the universe that is approximately 3×10^8 m/s;		*	

Topics and Sub-Topics		Student Learning Outcomes	Cognitive level		
			R	U	A and beyond
2.4 Graphical Analysis of Motion	2.4.1	interpret distance-time graph and speed-time graph;			E
	2.4.2	determine the slope/ gradient of distance-time and speed-time graph;			A
	2.4.3	infer the following states of a body based on the given graph: a. at rest, b. moving with constant speed, c. moving with positive acceleration, d. moving with negative acceleration;			An
	2.4.4	calculate the area under the speed-time graph of uniformly accelerated objects to find out the distance covered by the objects;			A
2.5 Motion due to Gravity	2.5.1	define acceleration due to gravity;	*		
	2.5.2	solve word problems related to free-falling bodies using the relation $g = \Delta v / \Delta t$.			A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
3. Dynamics		Students should be able to:				
	3.1 Mass and Weight	3.1.1	differentiate between mass and weight;		*	
		3.1.2	explain that the mass of an object resists changes from its state of rest or motion (inertia);		*	
		3.1.3	define gravitational field strength;	*		
		3.1.4	solve word problems using the relation $w = mg$;			A
	3.2 Force	3.2.1	describe the concept of force with its SI unit;		*	
		3.2.2	define contact and non-contact forces;	*		
		3.2.3	identify the following forces as contact and non-contact forces: a. air resistance, b. drag force (push, pull), c. electrostatic force, d. force of friction, e. gravitational force, f. magnetic force, g. tension (elastic force), h. thrust (driving force);		*	
		3.2.4	state four fundamental forces of nature in terms of their relative strength;	*		
		3.2.5	mention the role of Pakistani scientists in proving the weak forces and the electromagnetic force are unified;	*		
		3.2.6	represent the forces acting on a body using a free-body diagram;			A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
3.3	Newton's Laws of Motion	3.3.1	explain Newton's laws of motion;		*	
		3.3.2	state the limitations of Newton's laws of motion;	*		
		3.3.3	identify the effect of force on velocity of a body acting in the: a. same direction, b. opposite direction, c. perpendicular direction;		*	
		3.3.4	determine the resultant of two or more forces acting along the same straight line;			A
		3.3.5	identify those objects falling in the presence of a resistive force may reach a terminal (constant) velocity;		*	
3.4	Momentum	3.4.1	define momentum with its units;	*		
		3.4.2	explain the relationship between force and momentum;		*	
		3.4.3	describe impulse with examples;		*	
		3.4.4	solve word problems related to momentum and impulse;			A
		3.4.5	state the law of conservation of momentum;	*		
		3.4.6	solve word problems using the law of conservation of momentum in one dimension;			A
		3.4.7	apply scientific and engineering ideas to design a device that minimises the force on an object during a collision (e.g., helmet or parachute);			FA[2]

[2]FA= Formative Assessment, not to be assessed under examination conditions.

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
3.5	Friction	3.5.1 3.5.2 3.5.3	define friction; differentiate between rolling friction and sliding friction; list various methods to reduce friction;	* *	 *	
3.6	Uniform Circular Motion	3.6.1 3.6.2	define centripetal force; exemplify the sources of centripetal force during circular motion in terms of: a. tension, b. frictional force, c. gravitational force.	*	*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
4. Turning Effect of Forces		Students should be able to:				
4.1	Forces on Bodies	4.1.1	define like and unlike parallel forces;	*		
		4.1.2	explain the turning effect of force by relating it to everyday life;		*	
		4.1.3	solve word problems related to the *moment of force or torque = force × perpendicular distance from the pivot to the line of action of force*;			A
4.2	Principle of Moments	4.2.1	state the principle of moments;	*		
		4.2.2	solve word problems related to the principle of moments;			A
4.3	Centre of Gravity	4.3.1	define centre of gravity and centre of mass of a body;	*		
		4.3.2	explain effects of position of the centre of gravity on the stability of simple objects;		*	
4.4	Equilibrium	4.4.1	define equilibrium;	*		
		4.4.2	classify the different types of equilibrium by using examples from everyday life;		*	
		4.4.3	state the conditions of equilibrium;	*		
		4.4.4	explain different conditions of equilibrium with examples;		*	
		4.4.5	describe the states of equilibrium and classify them with common examples.		*	

Topics and Sub-Topics		Student Learning Outcomes	Cognitive level		
			R	U	A and beyond
5. Deformation of Solids		Students should be able to:			
5.1 Hook's law	5.1.1	illustrate that force may produce a change in the size and shape of an object;			A
	5.1.2	state Hooke's law;	*		
	5.1.3	define spring constant;	*		
	5.1.4	solve word problems using the relation $k = F/x$;			A
	5.1.5	describe applications of Hook's law in measuring instruments such as spring scale, galvanometer, and balance wheel of mechanical clock;		*	
	5.1.6	interpret load extension graphs for elastic solids.			E

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
6. Work, Energy and Power		Students should be able to:				
6.1	Work	6.1.1	define work and state its SI unit;	*		
		6.1.2	solve word problems related to workdone;			A
6.2	Forms of Energy	6.2.1	define energy with its SI unit;	*		
		6.2.2	describe forms of energy stored in various objects such as gravitational potential, chemical, elastic (strain), nuclear, electrostatic and internal (thermal) energies;		*	
6.3	Kinetic Energy and Potential Energy	6.3.1	compare kinetic energy (K.E) and potential energy (P.E);		*	
		6.3.2	derive the formulae of kinetic energy $K.E = ½ mv^2$ and potential energy $P.E = mg\Delta h$;			A
		6.3.3	solve word problems related to the kinetic and potential energy;			A
6.4	Conversion of Energy	6.4.1	state law of conservation of energy;	*		
		6.4.2	describe the processes that convert energy from one form to another with reference to: a. biomass power generation b. car engines, c. geothermal power, d. hydroelectric generation, e. nuclear reactors, f. solar power panels, g. wind turbine,		*	
		6.4.3	discuss that perpetual machines do not work;			E
		6.4.4	list the environmental issues associated with power generation;	*		

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
		6.4.5	differentiate between non-renewable and renewable energy sources with examples of each;		*	
		6.4.6	describe the advantages and disadvantages of different methods of power generation;		*	
6.5	Efficiency	6.5.1	define the efficiency of a working system;	*		
		6.5.2	calculate the efficiency of an energy conversion system using the formula: *Efficiency* (%) = *energy converted into the required form / total energy input;*			A
		6.5.3	explain that a system cannot have an efficiency of 100%;		*	
6.6	Power	6.6.1	define power;	*		
		6.6.2	solve word problems related to the concept of power;			A
		6.6.3	explore different innovative energy transfer devices used in transportation and communication.			FA

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
7. Pressure		Students should be able to:				
7.1	Density	7.1.1	define the term 'density';	*		
		7.1.2	compare the densities of three states of matter (solids, liquids and gases);		*	
		7.1.3	solve word problems using the relation of density;			A
		7.1.4	compare the densities of different liquids to prepare a well-balanced shake/ smoothie for a restaurant;		FA	
7.2	Pressure	7.2.1	define the term 'pressure';	*		
		7.2.2	explain that pressure varies with force and area with the help of real-life examples;		*	
7.3	Atmospheric Pressure	7.3.1	explain atmospheric pressure;		*	
		7.3.2	describe the use of the height of a liquid column to measure the atmospheric pressure (barometer);		*	
		7.3.3	describe that atmospheric pressure decreases with the increase in height above the earth's surface;		*	
		7.3.4	explain that changes in atmospheric pressure in a region may indicate a change in the weather;		*	
7.4	Pressure in Liquids	7.4.1	state Pascal's law;	*		
		7.4.2	discuss the use of Pascal's law (including hydraulic press and hydraulic brakes on vehicles);			E
		7.4.3	explain pressure beneath a liquid surface increase with depth and depends on the density of the liquid, i.e., $P = \rho gh$;		*	
		7.4.4	solve word problems related to the relationship between pressure, depth and liquid density;			A
		7.4.5	discuss the working and applications of liquid manometer.			E

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
8. Thermal Physics		Students should be able to:				
8.1	Kinetic Molecular Theory	8.1.1	state the basic assumptions of the kinetic theory of matter;	*		
		8.1.2	compare the structure of solids, liquids and gases based on the kinetic theory of matter;		*	
		8.1.3	describe plasma as the fourth state of matter;		*	
		8.1.4	state the relationship between the motion of particles and temperature;	*		
		8.1.5	discuss that an increase in the temperature of an object increases its internal energy;			E
8.2	Thermal Properties of Matter	8.2.1	describe the thermal expansion of solids in terms of: a. linear expansion, b. volumetric expansion;		*	
		8.2.2	explain the thermal expansion of liquids as the: a. real expansion, b. apparent expansion;		*	
		8.2.3	define the terms 'heat capacity' and 'specific heat capacity';	*		
		8.2.4	describe latent heat of fusion and latent heat of vaporisation;		*	
		8.2.5	describe melting, solidification, boiling and condensation in terms of energy transfer without the change in temperature;		*	
		8.2.6	determine heat of fusion and heat of vaporisation of ice and water respectively by sketching a temperature-time graph;			A
		8.2.7	solve word problems involving the concept of specific heat capacity, latent heat of fusion and vaporisation;			A
		8.2.8	describe the process of evaporation and how it is different from boiling;		*	
		8.2.9	explain that evaporation causes cooling;		*	
		8.2.10	describe factors that influence the rate of surface evaporation;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
8.3	Temperature Scale and Thermometer	8.3.1	describe the Celsius, Fahrenheit, and Kelvin temperature scales and their relationships using fixed reference points;		*	
		8.3.2	convert temperature from one scale to another (Fahrenheit, Celsius and Kelvin scales);			A
		8.3.3	explain that a physical property that varies with temperature can be used as a criteria to measure temperature;		*	
		8.3.4	illustrate the sensitivity, range and linearity of thermometers using diagram;			A
		8.3.5	compare liquid in glass thermometer and thermo-couple on the bases of structure, sensitivity, range and linearity.		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
9. Transfer of Thermal Energy		Students should be able to:				
9.1	Conduction	9.1.1	explain thermal conduction in solids;		*	
		9.1.2	define the term 'thermal conductivity';	*		
		9.1.3	describe the factors affecting the transfer of heat through solid conductors;		*	
		9.1.4	solve word problems related to the thermal conductivity of solid conductors;			A
		9.1.5	describe good and bad conductors of heat with examples;		*	
		9.1.6	list the uses of good and bad conductors;	*		
9.2	Convection	9.2.1	explain convection in liquids and gases in terms of density changes with reference to the following real-life examples: a. gliders, b. flying of birds, c. land breezes and sea breezes;		*	
		9.2.2	design a thought experiment to illustrate convection;			FA
		9.2.3	describe that convection currents in seawater facilitate the distribution of heat, nutrients, and oxygen in supporting marine ecosystems;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
9.3	Radiation	9.3.1	define the process of thermal energy transfer by radiation;	*		
		9.3.2	describe the effect of surface colour (black or white) and texture (dull or shiny) on the emission, absorption and reflection of infrared radiation;		*	
		9.3.3	describe that the rate of emission of radiation depends on the surface temperature and surface area of an object;		*	
		9.3.4	design experiments to distinguish between good and bad emitters of infrared radiation;			FA
9.4	Effects of Heat Transfer	9.4.1	discuss everyday applications of conduction, convection and radiation including: a. heating objects such as kitchen pans, b. heating of room by convection, c. measuring temperature using an infrared thermometer, d. using thermal insulation to maintain the temperature of a liquid and to reduce thermal energy transfer in buildings, e. the mechanism of a household hot-water system;			E
		9.4.2	describe the greenhouse effect based on heat radiation emitted by the sun;		*	
		9.4.3	explore the impacts of heat transfer and conservation on people's bedding and clothing in various climatic regions of South Asia.			FA

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
10. Nature of Science		Students should be able to:				
10.1	Physics and its Interaction	10.1.1	describe Physics as the study of matter, energy, space, time and their interactions;		*	
10.2	Sub-Fields of Physics	10.2.1 10.2.2	mention Physics as a subset of physical and natural science; relate different branches of physics with real-life examples;	* 	 *	
10.3	Scientific Approach/ Method	10.3.1	define different scientific methods (hypothesis, theory and law) for carrying out investigations;	*		
10.4	Science, Technology and Engineering	10.4.1	describe the importance of Physics in science, technology and engineering.		*	

Part II (Grade X)

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level[1]		
				R	U	A and beyond
11. Wave Motion		Students should be able to:				
11.1	Oscillatory Motion	11.1.1	define the following: a. amplitude, b. frequency, c. oscillatory motion d. periodic motion, e. time period;	*		
		11.1.2	discuss the factors on which the time period of a simple pendulum depends;			E
		11.1.3	solve word problems related to time period of a simple pendulum;			A
11.2	Wave Motion	11.2.1	define mechanical waves;	*		
		11.2.2	describe wave motion as illustrated by vibrations in rope, a slinky spring and by experiments with water waves;		*	
		11.2.3	describe that waves transfer energy without transferring matter;		*	
11.3	Longitudinal and Transverse Waves	11.3.1	identify transverse and longitudinal waves in mechanical media;		*	
		11.3.2	distinguish between mechanical and electromagnetic waves;		*	

[1]R = Remember, U = Understand, A = Apply and beyond [Apply (A), Analyse (An), Evaluate (E), Create (C)]

Topics and Sub-Topics		Student Learning Outcomes	Cognitive level		
			R	U	A and beyond
11.4 Characteristics of Waves	11.4.1	define the following terms: a. speed (v), b. wavelength (λ), c. crest, d. trough, e. wavefront, f. compression and rarefaction;	*		
	11.4.2	analyse key characteristics of waves by interpreting graphical representations of waveforms;			An
	11.4.3	derive equation $v = f\lambda$;			A
	11.4.4	solve word problems using the relation $f = 1/T$ and $v = f\lambda$;			A
11.5 Properties of Waves	11.5.1	define the following terms: a. reflection, b. refraction, c. diffraction;	*		
	11.5.2	describe the properties of waves such as reflection, refraction and diffraction with the help of the ripple tank effect.		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
12. Sound		Students should be able to:				
12.1	Sound Waves	12.1.1	explain the production of sound waves;		*	
		12.1.2	explain that sound waves cannot travel in a vacuum;		*	
		12.1.3	describe that the speed of sound depends upon the physical characteristic of a medium;		*	
		12.1.4	describe the longitudinal nature of sound waves;		*	
		12.1.5	state audible frequency range;	*		
12.2	Characteristics of Sound	12.2.1	define the terms 'pitch', 'loudness' and 'quality of sound';	*		
		12.2.2	describe graphically the effect of changes in amplitude on loudness and the effect of changes in frequency on the pitch of sound;		*	
		12.2.3	define the intensity of sound and state its SI unit;	*		
		12.2.4	describe the intensity level of sound and mention its unit;		*	
		12.2.5	solve word problems related to the intensity level of sound;			A
12.3	Echo	12.3.1	describe an echo as the reflection of sound waves;		*	
		12.3.2	describe simple experiments to show the reflection of sound waves;		*	
		12.3.3	examine a method involving a measurement of distance and time for determining the speed of sound in air;			An
12.4	Infra-Sound and Ultra-Sound	12.4.1	describe infrasound with examples;		*	
		12.4.2	describe ultrasound with examples;		*	
12.5	Acoustic Protection and Noise Pollution	12.5.1	describe the importance of acoustic protection;		*	
		12.5.2	analyse the effects of noise pollution on the environment.			An

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
13.	**Geometrical Optics**	Students should be able to:				
	13.1 Reflection of Light	13.1.1	describe with reference to the reflection of light the following terms: a. normal, b. angle of incidence, c. angle of reflection;		*	
		13.1.2	state laws of reflection of light;	*		
		13.1.3	discuss the relationship of the position of an object with the characteristics of image formed by a plane mirror;			E
	13.2 Refraction of Light	13.2.1	describe with reference to the refraction of light the following terms: a. angle of incidence, b. angle of refraction, c. refractive index;		*	
		13.2.2	state laws of refraction of light;	*		
		13.2.3	solve word problems of refractive index using the given formulae: a. sin ∠i/ sin ∠r, b. speed of light in vacuum/ speed of light in the given medium, c. real depth/ apparent depth;			A
		13.2.4	illustrate the passage of light ray through parallel-sided transparent material (glass slab);			A
		13.2.5	illustrate the passage of light through a glass prism;			A
	13.3 Dispersion of Light	13.3.1	explain the dispersion of light by a prism;		*	
		13.3.2	explain the scattering of light by the molecules in the air;		*	
		13.3.3	state the traditional seven colours of the visible spectrum in order of frequency and in order of wavelength;	*		

Topics and Sub-Topics	Student Learning Outcomes		Cognitive level		
			R	U	A and beyond
13.4 Total Internal Reflection	13.4.1	define total internal reflection;	*		
	13.4.2	state the conditions necessary for total internal reflection;	*		
	13.4.3	describe the relation between critical angle and refractive index;		*	
	13.4.4	solve word problems related to the critical angle and refractive index;			A
	13.4.5	describe the use of total internal reflection in: a. optical fibre, b. periscope;		*	
13.5 Image Location by Lens Equation	13.5.1	illustrate the action of thin converging and thin diverging lenses on a parallel beam of light;			A
	13.5.2	draw images by placing objects at different positions in front of convex and concave lens;			A
	13.5.3	differentiate between real and virtual images;		*	
	13.5.4	solve word problems related to the image location by lenses using lens formula;			A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
13.6	Power of a Lens	13.6.1 13.6.2	define power of a lens and state its unit; define magnifying power of lens;	* *		
13.7	Double Convex Lens	13.7.1 13.7.2	define least distance of distinct vision; describe the use of a single lens (magnifying glass) with its ray diagram;	*	*	
13.8	Defects in Human Eye	13.8.1 13.8.2 13.8.3	define short-sightedness and long-sightedness; draw ray diagrams to show the formation of images in the eye of an individual with reference to: a. normal vision, b. short-sightedness, c. long-sightedness; describe the correction of short-sightedness and long-sightedness using concave and convex lenses;	*	 *	A
13.9	Gravitational and Acoustic Lensing	13.9.1	define the following: a. acoustic lensing, b. gravitational lensing.	*		

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
14. Electrostatics		Students should be able to:				
	14.1 Electric Charge	14.1.1	define charge and its types;	*		
		14.1.2	describe electric charge as an integral multiple of elementary charge (electron);		*	
		14.1.3	explain that charging of solids by friction involves only a transfer of negative charge (electrons);		*	
		14.1.4	describe production and detection of electric charge;		*	
		14.1.5	explain discharging of an insulator by: a. putting it above a flame, b. exposing it to damp conditions;		*	
	14.2 Electrostatic Force	14.2.1	state that unlike charges attract and like charges repel;	*		
		14.2.2	explain Coulomb's law;		*	
		14.2.3	solve word problems related to the electrostatic charges by using Coulomb's law;			A
	14.3 Electrostatic Induction	14.3.1	describe the process of electrostatic induction;		*	
		14.3.2	explain charging of a conductor by electrostatic induction;		*	

Topics and Sub-Topics	Student Learning Outcomes		Cognitive level		
			R	U	A and beyond
14.4 Applications of Electrostatics	14.4.1	describe the application of electrostatics in electrostatic precipitator and photocopier;		*	
	14.4.2	explain the process of lightning in atmosphere during thunderstorms;		*	
	14.4.3	identify different kinds of electrical lightning includes: a. ball lightning, b. elves, c. ghosts, d. jets, e. pixies, f. sprites, g. trolls;		*	
14.5 Electric Field	14.5.1	define electric field and electric field intensity;	*		
	14.5.2	describe that the direction of an electric field line at a point is the direction of the force exerted on a positive charge at that point;		*	
	14.5.3	draw electric field lines for: a. an isolated positive charge, b. an isolated negative point charge, c. two-point charges having opposite charge, d. two-point charges having identical charge;			A
	14.5.4	explain phenomenon of electrical breakdown with its practical application in: a. corona discharge ozone generator b. gas discharge lamp, c. lightning rod, d. plasma display;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
15. Electric Current		Students should be able to:				
15.1	Electric Current	15.1.1	define electric current;	*		
		15.1.2	differentiate between conventional and non-conventional current;		*	
		15.1.3	differentiate between direct current (D.C.) and alternating current (A.C.);		*	
		15.1.4	solve word problems related to electric current using $I = \frac{Q}{t}$;			A
15.2	Conductor and Insulator	15.2.1	distinguish between conductors and insulators;		*	
		15.2.2	describe electrical conduction in metals in terms of the movement of free electrons;		*	
15.3	Resistance and Resistivity	15.3.1	define resistance and resistivity with its SI unit;	*		
		15.3.2	describe the following factors affecting the resistance of a metallic conductor: a. length of a conductor, b. cross-sectional area of a conductor, c. nature of a conductor, d. temperature of a conductor;		*	
		15.3.3	describe the phenomenon of superconductivity in solids;		*	
		15.3.4	describe the action of negative temperature coefficient (NTC) in thermistors and light dependent resistors;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
15.4	Potential Difference and Electromotive Force (e.m.f.)	15.4.1	define potential difference	*		
		15.4.2	solve word problems related to potential difference using $V = \frac{work}{q}$;			A
		15.4.3	compare potential difference and electromotive force;		*	
		15.4.4	state that the e.m.f. of identical power sources connected in parallel is equal to the e.m.f. of one of the sources;	*		
		15.4.5	calculate the total e.m.f. where several power sources are arranged in series;			A
15.5	Ohm's Law	15.5.1	state Ohm's law with its limitations;	*		
		15.5.2	interpret the I-V characteristics graph for a fixed resistor, a filament lamp and a thermistor;			E
15.6	Electrical Power and Joule's Law	15.6.1	define electrical power;	*		
		15.6.2	explain Joule's law in terms of energy dissipated in the resistor;		*	
		15.6.3	solve word problems related to $E = IVt = I^2Rt = V^2 t / R$;			A
		15.6.4	calculate the total energy cost based on the cost price of kWh;			A
15.7	Electrical Measuring Instruments	15.7.1	state the use of electrical measuring devices; (galvanometer, ammeter and voltmeter)	*		

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
15.8	Alternating Current (A.C.) and Safety Measures	15.8.1	describe the functions of live, neutral and earth wires in the domestic main power supply;		*	
		15.8.2	state common uses of electricity; (including heating, lighting, battery charging and powering motors and electronic systems);	*		
		15.8.3	describe common electric hazards that can result from malpractice and lack of maintenance; (damaged insulation, overheating cables, damp conditions, excess current from overloading of plugs, extension leads, single and multiple sockets when using a main supply);		*	
		15.8.4	explain the importance of connecting domestic (A.C.) supplies in parallel;		*	
		15.8.5	describe the usage of A.C. in daily life (switches, fuses, circuit breakers);		*	
		15.8.6	explain the safety measures in household electricity.		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
16. D.C. Circuits		Students should be able to:				
	16.1 Series and Parallel Combination of Resistance	16.1.1	describe the characteristics of series and parallel combinations of resistors;		*	
		16.1.2	derive the effective/ equivalent resistance of resistors connected in series and in parallel;			A
		16.1.3	calculate the effective/ equivalent resistance of resistors connected in series, parallel and both;			A
	16.2 Circuit Diagram and Circuit Components	16.2.1	define electric circuits;	*		
		16.2.2	draw the circuit diagrams of the following electrical components: a. ammeters, b. batteries, c. cells, d. diodes, e. fuses, f. lamps, g. light-dependent resistors (LDRs), h. light-emitting diodes (LEDs), i. resistors (fixed and variable), j. switches, k. thermistors (NTC only), l. voltmeters;			A
		16.2.3	calculate current, voltage, power and resistance in parts of a circuit or in the whole circuit that includes three resistors.			A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
17. Magnetism and Electromagnetism		Students should be able to:				
17.1	Domain Theory	17.1.1	define magnetic and non-magnetic substances;	*		
		17.1.2	state domain theory of magnetism;	*		
		17.1.3	explain magnetisation and demagnetisation of materials in light of domain theory;		*	
		17.1.4	define diamagnetic, paramagnetic and ferromagnetic solids;	*		
		17.1.5	compare soft and hard ferromagnetic materials;		*	
		17.1.6	describe uses of permanent magnets and electromagnets;		*	
17.2	Magnetic Force and Magnetic Field	17.2.1	define the forces acting between magnetic poles and those between magnets and magnetic materials;	*		
		17.2.2	describe the direction of the magnetic field of a magnet at a point;		*	
		17.2.3	describe magnetic fields and magnetic lines of forces between the two poles of a magnet;		*	
		17.2.4	compare strong and weak magnetic fields;		*	
		17.2.5	define magnetic flux;	*		
		17.2.6	explain the formation of the Earth's magnetic field;		*	
17.3	Magnetic Field by Current Carrying Conductor	17.3.1	describe the pattern and direction of the magnetic field due to currents in straight wires and in solenoids;		*	
		17.3.2	describe the effect of changing the magnitude and direction of the current on the magnetic field;		*	
		17.3.3	describe the magnetic effect of a current in: a. loudspeakers, b. relays in switching circuits;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
17.4	Current Carrying Conductor in a Magnetic Field	17.4.1	show that a magnetic force acts on a current-carrying conductor in a magnetic field;			A
		17.4.2	state Fleming's left-hand rule;	*		
		17.4.3	describe the effect on the magnetic force of reversing the direction of current and magnetic field;		*	
		17.4.4	describe the magnetic field patterns between parallel current carrying conductors and relate these to the forces on the conductors;		*	
17.5	Magnetic Torque	17.5.1	describe that a current carrying coil in a magnetic field experiences a torque with the help of Fleming's left-hand rule;		*	
		17.5.2	describe the turning effect is increased by increasing the: a. area of a coil, b. electric current, c. number of turns on the coil, d. strength of the magnetic field;		*	
		17.5.3	describe construction and working of a D.C. motor.		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
18. Electromagnetic Induction		Students should be able to:				
18.1	Electromagnetic Induction	18.1.1	describe that a changing magnetic field can induce electromotive force (e.m.f.) in a wire or coil;		*	
		18.1.2	describe that the magnitude of an induced e.m.f. is affected by the: a. rate of change of the magnetic field or the rate of cutting of magnetic field lines, b. number of turns in a coil;		*	
18.2	Faraday's Law of Electromagnetic Induction and Lenz's Law	18.2.1	state Faraday's law of electromagnetic induction;	*		
		18.2.2	describe Lenz's law, setup an experiment to show that an e.m.f. induces with in a coil opposes the change that produces it;		*	
18.3	Alternating Current Generator	18.3.1	describe the simple construction and working of an A.C. generator;		*	
		18.3.2	interpret graphs of e.m.f. against time for simple A.C. generators;			E
18.4	Self and Mutual Induction	18.4.1	define self-induction;	*		
		18.4.2	define mutual induction;	*		
		18.4.3	describe inductance;		*	
18.5	Transformer	18.5.1	describe the construction and the principle of operation of a simple iron-cored transformer;		*	
		18.5.2	state the two types of transformers and their uses;	*		
		18.5.3	discuss the application of transformer in high voltage transmission;			E
		18.5.4	solve word problem using the transformer equation $\frac{V_s}{V_p} = \frac{I_p}{I_s} = \frac{N_s}{N_p}$;			A

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
19. Electromagnetic Waves and Electronics		Students should be able to:				
19.1	Electromagnetic Waves	19.1.1	describe the production, transmission and reception of electromagnetic (EM) waves;		*	
		19.1.2	describe the main regions of the electromagnetic spectrum in order of frequency and order of wavelength with their applications;		*	
		19.1.3	describe the damages caused by electromagnetic radiation;		*	
19.2	Thermionic Emission	19.2.1	explain the process of thermionic emission emitted from a filament;		*	
		19.2.2	describe the simple construction and use of an electron gun as a source of electron beam;		*	
19.3	Cathode Ray Oscilloscope (CRO)	19.3.1	describe the effect of electric and magnetic field on an electron beam;		*	
		19.3.2	describe the basic principle and uses of CRO and make a list of its uses;		*	
		19.3.3	interpret waveforms on oscilloscopes;			FA[2]
19.4	Introduction to Electronics	19.4.1	explain the importance of electronics;		*	
		19.4.2	compare analogue and digital electronics;		*	

[2]FA= Formative Assessment, not to be assessed under examination conditions.

Topics and Sub-Topics		Student Learning Outcomes	Cognitive level		
			R	U	A and beyond
19.5 Digital Electronics	19.5.1	state Boolean algebra;	*		
	19.5.2	convert decimal numbers into binary numbers;			A
	19.5.3	state the basic operations of digital electronics;	*		
	19.5.4	identify and make the symbols for the logic gates; (NOT, OR, AND, NOR and NAND)		*	
	19.5.5	state the action of logic gates in truth table form with two inputs;	*		
	19.5.6	use universal gates (NAND and NOR) to create NOT, OR and AND;			A
	19.5.7	describe the uses of logic gates.		*	

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Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
20. Atomic and Nuclear Physics		Students should be able to:				
	20.1 Structure of Atom	20.1.1	describe that the alpha particle scattering experiments provide evidence for: a. a very small nucleus surrounded by mostly empty space, b. a nucleus containing most of the mass of the atom, c. a nucleus that is positively charged;		*	
	20.2 Structure of Nucleus	20.2.1	describe the composition of the nucleus of an atom in terms of protons and neutrons;		*	
		20.2.2	explain that the number of protons in a nucleus distinguishes one element from the other;		*	
		20.2.3	show various nuclides by using the symbol of proton number (Z), nucleon number (A) and the nuclide notation (X);			A
	20.3 Isotopes	20.3.1	define isotopes;	*		
		20.3.2	state that an element may have more than one isotope;	*		
		20.3.3	describe the uses of isotopes in: a. diagnosis and treatment of cancer, b. household fire (smoke) alarms, c. irradiating food to kill bacteria, d. measuring and controlling thicknesses of materials, e. sterilisation of equipment;		*	

Topics and Sub-Topics		Student Learning Outcomes		Cognitive level		
				R	U	A and beyond
20.4	Radioactivity	20.4.1	define radioactivity;	*		
		20.4.2	explain that some nuclei are unstable;		*	
		20.4.3	describe the spontaneous and random emission of radiation from a nucleus;		*	
		20.4.4	describe the properties of the three types of radiation (α, β and γ);		*	
		20.4.5	explain that an element may change into another element when radioactivity occurs;		*	
		20.4.6	show changes in the composition of a nucleus by symbolic equations when alpha or beta particles are emitted from it;			A
20.5	Background Radiation	20.5.1	explain the existence of background radiation;		*	
		20.5.2	state the sources that make a significant contribution to the background radiation including: a. cosmic rays, b. food and drinks, c. radon gas (in the air), d. rocks and buildings;	*		
20.6	Half Life	20.6.1	explain half-life of a radioactive material;		*	
		20.6.2	calculate the half-life of radioactive elements;			A
		20.6.3	draw graphs showing decay curves of these elements;			An
		20.6.4	describe the process of carbon dating to estimate the age of ancient objects;		*	
20.7	Fission and Fusion	20.7.1	describe nuclear fission and fusion reactions;		*	
		20.7.2	calculate the energy released in the process of nuclear reaction using the equation $E = mc^2$;			A
		20.7.3	state the nature of the Sun consisting mostly of hydrogen and helium and radiates most of its energy;	*		

Topics and Sub-Topics	Student Learning Outcomes		Cognitive level		
			R	U	A and beyond
20.8 Safety Precautions	20.8.1	state the effects of ionising nuclear radiations on living things, including cell death, mutations and cancer;	*		
	20.8.2	explain that radioactive materials are moved, used and stored in a safe way, with reference to: a. reducing exposure time, b. using shield to absorb radiation, c. increasing distance between source and living tissue;		*	

Practical Activities of AKU-EB SSC Physics Syllabus

Topics

Content Covered	Actions Performed	Attitude Developed
• Mechanics • Waves Motion • Thermodynamics • Electricity and Magnetism	• Follow the safety precautions provided in the Lab guidelines. • Collect the required apparatus for the experiments. • Handle the apparatus/ equipment appropriately. • Perform the experiments with the help of given method/ steps. • Modify the steps to perform a similar experiment in the real-life settings. • Take readings with precision.	• Ensure safety of yourself, others around you and your surroundings. • Demonstrate a scientific mindset by asking questions and planning further investigations. • Display ethical dealings and practices while performing experiments. • Show willingness to solve problems and challenges. • Show self-reliance and cooperation when working independently and in a group setting respectively. • Revise judgements and change behaviour considering new evidence.

Topic Wise Practical Activities

Part I (Grade IX)

S. No.	Topic-Wise Practical Activities	Apparatus
	Topic 1: Measurement	
1	To find the weight of an unknown object using vector addition of forces.	Gravesand's apparatus, slotted weights with hangers, plane mirror strips, plumb line, thread.
2	To calculate the area of the cross-section of a solid cylinder by measuring the diameter with Vernier callipers.	Vernier callipers, solid cylinder.
3	To measure the thickness of a metal strip or the diameter of a wire using a screw gauge.	Screw gauge, wire or metal strip.
	Topic 2: Kinematics	
4	To find the acceleration of a ball rolling down an angle-iron by drawing a graph between distance (2S) and time (t^2).	Angle iron, iron ball, iron stand, stopwatch, set square.
5	To find the value of acceleration due to gravity "g" using the free-fall method.	Free fall apparatus, pendulum bob, thread, candle, piece of chalk, plumb line.

S. No.	Topic-Wise Practical Activities	Apparatus
	Topic 3: Dynamics	
6	To find the tension in strings by balancing a meter rod on the iron stands.	Two iron stands, two spring balances, meter rod, wedge, slotted weight with hangers, thread.
	Topic 4: Turning Effect of Forces	
7	To find the weight of an unknown object using the principle of moments.	Meter rod, weight box, thread, wooden wedge.
8	To verify the principle of moments using a meter rod balanced on a wedge.	Meter rod, weight box, thread, wooden wedge.
	Topic 5: Deformation of Solids	
9	To study the relationship between load and extension of a helical spring with the help of a graph.	Helical spring with stand, pan, weight box, meter rod.
	Topic 7: Pressure	
10	To find the density of an insoluble object that is heavier than water using Archimedes principle.	Physical/ digital balance, weight box, beaker, thread, small wooden bench, thermometer, water.
	Topic 8: Thermal Physics	
11	To draw a graph between temperature (ºC) against time (minutes) for the conversion of ice into water and then steam as a result of slow heating.	Thermometer, beaker, spirit lamp, sand, ice, stopwatch, burner.
12	To find the specific heat by the method of mixture using polystyrene cups. (used as a container of negligible heat capacity).	Polystyrene cup with lid and stirrer, hypsometer, burner, thermometer, Physical/ digital balance, weight box, water.

Part II (Grade X)

S. No.	Topic-Wise Practical Activities	Apparatus
	Topic 11: Wave Motion	
1	To prove that time period of a simple pendulum is independent of (i) the mass of the pendulum and (ii) the amplitude of the vibration.	Different metallic bobs with a hook, stopwatch, cork, Vernier callipers, thread, iron stand, meter rod, piece of chalk.
2	To study the effect of the change in the length of a simple pendulum on its time period and hence calculate the value of acceleration due to gravity "g".	A metallic bob with a hook, stopwatch, cork, Vernier callipers, thread, iron stand, meter rod, piece of chalk.
	Topic 12: Sound	
3	To measure the length of the resonance column in a resonance tube for different tunning forks.	Resonance apparatus, different tuning forks of known frequencies, thermometer, Vernier callipers, rubber pad, two set squares, beaker.
	Topic 13: Geometrical Optics	
4	To verify the laws of refraction of light using a glass slab.	Glass slab, drawing pins, common pins, drawing board, white paper.
5	To trace the path of a ray of light through glass a prism and measure the angle of deviation.	Glass prism, drawing board, common pins, drawing pins, white paper, meter rod.
6	To find the focal length of a convex lens by the parallax method using two pins.	Convex lens, knitting needles, convex lens holder, needle stands, optical bench.

S. No.	Topic-Wise Practical Activities	Apparatus
	Topic 15: Electric Current	
7	To verify Ohm's law using a wire as a conductor.	Voltmeter, ammeter, battery, connecting wires, resistance, rheostat.
8	To find the resistance of a galvanometer by the half deflection method.	Galvanometer, high resistance box, fractional resistance box, two key plugs, cell (1.5 V), connecting wires.
	Topic 16: D.C. Circuits	
9	To study resistance in a series circuit.	Two resistances, voltmeter, ammeter, key, battery, connecting wires, sandpaper.
10	To study resistance in a parallel circuit.	Two resistances, voltmeter, ammeter, key, battery, connecting wires, sandpaper.
	Topic 17: Magnetism and Electromagnetism	
11	To trace the magnetic field lines created due to a current-carrying circular coil.	A circular coil of insulated copper fitted in a board, a white paper sheet (A-4 size), scissors, a compass needle, battery, key plug, rheostat, connecting wires.
	Topic 19: Electromagnetic Waves and Electronics	
12	To verify the truth tables of the OR and the AND gates.	DC power supply, OR gate (7432), AND gate (7408), LED indicator module, two key plugs, connecting wires.

Scheme of Assessment

Grade IX

Table 1: Exam Specifications

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
1	Measurements	3	Total 3 Marks (1 CRQ)		6
2	Kinematics	6		5 Marks Choose any ONE from TWO	11
3	Dynamics	8			13
4	Turning Effect of Forces	2	Total 3 Marks (1 CRQ)		5
5	Deformation of Solids	1	Total 3 Marks (1 CRQ)		4
6	Work, Energy and Power	6		5 Marks Choose any ONE from TWO	11
8	Thermal Physics	6			11
7	Pressure	4	Total 3 Marks (1 CRQ)		7
9	Transfer of Thermal Energy	2	Total 3 Marks (1 CRQ)		5
10	Nature of Science	2			2
	Total	**MCQ 40**	**CRQ 15**	**ERQ 10**	**65**
	Practical*				**10**
	Total				**75**

Note: The cognitive distribution of marks for Physics SSC are as follows
Remember: 10 to 15 %
Understand: 55 to 60 %
Apply and beyond: 20 to 30 %

Grade X

Table 2: Exam Specifications

Topic No.	Topics	Marks Distribution			Total Marks
		MCQs	CRQs	ERQs	
11	Wave Motion	2	Total 2 Marks (1 CRQ)		4
12	Sound	2	Total 2 Marks (1 CRQ)		4
13	Geometrical Optics	6		5 Marks Choose any ONE from TWO	11
14	Electrostatics	3			8
15	Electric Current	6		5 Marks Choose any ONE from TWO	11
18	Electromagnetic Induction	3			8
16	DC circuit	2	Total 2 Marks (1 CRQ)		4
17	Magnetism and Electromagnetism	6	Total 3 Marks (1 CRQ)		9
19	Electromagnetic Waves and Electronics	4	Total 3 Marks (1 CRQ)		7
20	Atomic and Nuclear Physics	6	Total 3 Marks (1 CRQ)		9
	Total	**MCQs 40**	**CRQs 15**	**ERQs 10**	**65**
	Practical*				**10**
	Total				**75**

Note: The cognitive distribution of marks for Physics SSC are as follows
Remember: 10 to 15 %
Understand: 55 to 60 %
Apply and beyond: 20 to 30 %

Examination Structure and Practical Requirements for Grades IX and X

Theory:

- Multiple Choice Question (MCQ) requires candidates to choose one best/ correct answer from four options for each question. Each MCQ carries ONE mark.
- Constructed Response Question (CRQ) requires students to respond with a short text (few phrases/ sentences), calculations or diagrams.
- Extended Response Question (ERQ) requires students to answer in a more descriptive form. The answer should be in paragraph form, with diagrams where needed, and address all parts of the question.
- Table 1 to 2 contains the mark distribution for each topic.
- There will be two examinations, one at the end of grade IX and one at the end of grade X.
- In each grade, the theory paper will be of 3 hours and will consist of two parts: paper I and paper II.
- Paper I theory will consist of 40 compulsory, multiple choice items. These questions will involve four responses options. The answer sheet for paper I will be provided separately.
- Paper II theory will carry 25 marks and consist of Constructed Response Questions (CRQs) and Extended Response Questions (ERQs). Each extended response question will be presented in an either/ or form.
- The booklet for paper II will serve as an answer script.

Practical:

- In each grade, practical examination (Paper III) will be conducted separate from the theory paper and will consist of 10 marks.
- Practical examination (Paper III) will be based on the list of practical activities given in the examination syllabus. Schools may design their own practical manuals based on these activities for teaching and learning purpose.
- Practical journal/ portfolio should be developed by students and endorsed by a figure of authority, such as a teacher or principal, and submitted at the time of the practical examination (Paper III).
- It is essential for each school to equip its laboratories with chemicals, instruments, apparatus, specimens etc. according to the requirements of the practical activities. Each school will be responsible to make sure that each student is provided the opportunity to do the practical activities.

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