



**FEDERAL BOARD OF INTERMEDIATE
AND SECONDARY EDUCATION
H-8/4, ISLAMABAD**



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NOTIFICATION

The Assessment Frameworks for Composite Practical-Based Assessment (PBA), in accordance with the Inclusive Scheme of Studies 2024 (Revised Version-I), comprising lists of experiments/practicals, relevant instructions, and Model Question Papers (Composite) for the subjects of Physics, Chemistry, Biology, and Computer Science at SSC and HSSC levels, based on the National Curriculum of Pakistan 2022–23, along with the E-Sheets for the said subjects, are hereby notified for implementation with effect from the First Annual Examination 2027 and onwards.

2. The Assessment Frameworks for Composite PBA and E-Sheets are available at FBISE website. The weblink is https://www.fbise.edu.pk/curriculum_model_paper.php

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ASSESSMENT FRAMEWORK

FOR PRACTICAL BASED ASSESSMENT (PBA) - COMPOSITE

PHYSICS

SSC LEVEL



NATIONAL CURRICULUM OF PAKISTAN (2022-23)

SCHEME OF STUDIES 2024

WE WORK FOR EXCELLENCE

**FEDERAL BOARD OF INTERMEDIATE AND SECONDARY
EDUCATION (FBISE), ISLAMABAD**



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ACKNOWLEDGEMENT

It is a great honour that we at the Federal Board of Intermediate and Secondary Education (FBISE) has developed the Assessment Framework (AF) for the Practical Based Assessment (PBA) of Physics at the Secondary School Certificate (SSC) level. The primary objective of the Assessment Framework is to optimize the Student Learning Outcomes (SLOs) of curriculum 2022-23 that are associated with practical concepts and laboratory work. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes of SSC level Physics curriculum.

This significant undertaking was the result of a series of extensive meetings and collaborative efforts of the subject and assessment experts. Their dedication and expertise have been instrumental in bringing this framework to fruition.

The Assessment Framework for Practical Based Assessment (PBA) will serve as a guiding document for students, teachers, and paper setters. Students will receive clear directions for preparing themselves for the PBA examinations. Similarly, teachers will use it as a guide to perform laboratory work and to prepare students for the final PBA examinations. Paper setters of PBA will also seek guidance from this document and prepare PBA paper accordingly for annual examinations. It may be noted that only those students will be able to attempt the PBA paper who have performed all the practicals in laboratory.

Following subject as well as assessment experts remained constantly engaged in the development of the Assessment Framework for PBA:

1. Mr. Muhammad Jahangir Mirza, HOD Physics, OPF College for Boys, H-8/4 Islamabad
2. Mr. Muhammad Imran Khaliq, Assistant Professor, Islamabad Model College for Boys, G-10/4, IBD
3. Ms. Sehrish Imran, Lecturer, Islamabad Model College for Girls, I-8/4, Islamabad
4. Ms. Saima Waheed Khan, Subject Experts, APSAC Secretariat Rawalpindi

The whole work was successfully accomplished under the able supervision and guidance of Dr. Ikram Ali Malik, Chairman, FBISE and due to the hard work and dedication of the staff of Research Section of FBISE, in particular, Syed Zulfiqar Shah, Deputy Secretary, Research and Academics who played pivotal role in finalizing the Assessment Framework for PBA.

MIRZA ALI
Director (Test Development)
FBISE, Islamabad

ABOUT THE PBA ASSESSMENT FRAMEWORK

To ensure clarity and precision in the understanding of Practical Based Assessment (PBA) Question Paper, the Student Learning Outcomes (SLOs) have been categorized into two distinct groups: formative for PBA and summative for PBA in the composite Assessment Frameworks for SSC Classes based on the Revised Version-I of Inclusive Scheme of Studies 2024. Subsequently, all the SLOs of SSC-I and SSC-II meant for summative PBA have been translated into workable and functional composite lists of practicals which are part of this booklet. This extraction of lists of practicals helps in effectively measuring student progress and understanding of the scientific concepts linked with laboratory work. These practicals must be performed by the students under the supervision of their teachers in the laboratories in order to prepare themselves for the PBA Examinations.

The Assessment Framework for Practical Based Assessment (PBA) will act as a comprehensive guide for students, teachers, and paper setters. Students will receive clear instructions in order to perform practicals in the laboratory and prepare themselves for the PBA examination. Teachers will use the same to strategize the optimal use of the laboratory for performing practicals.

The Model Question Paper for Practical Based Assessment (PBA), along with clear instructions, has also been developed and made part of this booklet to provide a structured format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of PBA examination.

All the practicals have been aligned with their corresponding SLOs marked summative for PBA. The purpose of this alignment is to explain how the practicals relate with their corresponding summative SLOs for PBA.

Instructions for paper setters have also been included before the PBA model question paper, providing self-explanatory guidance on the selection and nature of each question which is part of the model paper.



PRACTICAL BASED ASSESSMENT (PBA) COMPOSITE
Physics SSC Level for Annual Examination 2027 & onwards
Physics Curriculum (2022-23)-Scheme of Studies 2024



Guidelines/instructions for teachers /paper setters:

- i. This PBA paper consists of two sections i.e section A and B.
- ii. The weightage of section A is 60% i.e 18 marks, while that of section B is 40 % i.e 12 marks.
- iii. Section A includes Major Practicals. This section contains three questions, each of 6 marks and containing sub-parts. Each question tests a single practical and focuses on student's performance, calculations, procedures, or observations.
- iv. Section B includes Minor Practicals. This section also contains three questions, four marks each. Questions may be based on single or multiple practicals in this section.
- v. In Practical Based Assessment (PBA), there are no marks for practical notebooks and viva voce. However, students may record procedures, observations, apparatus and calculation etc on any type of plain papers/work sheets / practical folders for their future memory of all aspects of practical performance in order to attempt the PBA Examination amicably.
- vi. It should be noted that performance of all the prescribed practicals is mandatory in the laboratory during the whole academic session because only those students will be able to attempt the PBA who have performed the practicals in the laboratory as per requirement of each practical.
- vii. MCQs will not be included/assessed in the Practical Based Assessment paper.
- viii. Questions carrying 0.5 mark will not be included/assessed as single part in any section of the PBA paper.



**List of Experiments aligned with SLOs (Composite PBA)
For SSC Annual Examination 2027 & onwards
Physics Curriculum (2022-23) - Scheme of Studies 2024**



Note: In the Practical-Based Assessment (PBA), questions will be taken/developed from the list of experiments provided below, aligned with the summative SLOs listed in the corresponding column.

Section A (60% of practical marks — 18 Marks)

	List of Experiments	Aligned SLOs
Major Practicals	1. Measure the radius and length of a metallic cylinder using vernier callipers up to correct number of significant figures.	[SLO: P-09-10-N-17] make measurements using common laboratory apparatus, such as millimeter scales, protractors, top-pan balances, newton meters, analogue or digital electrical meters, measuring cylinders, vernier callipers, micrometer screw gauges and thermometers. [SLO: P-09-A-19] Determine the least count of a data collection instrument (analog) from its scale [SLO: P-09-A-16] Round off and justify calculation estimates [Based on empirical data to an appropriate number of significant figures]. [SLO: P-09-10-N-20] measurement of physical quantities such as length, volume or force.
	2. Analyze the thickness of a metallic wire with vernier calipers and a screw gauge with their respective precision.	[SLO: P-09-10-N-17] make measurements using common laboratory apparatus, such as millimeter scales, protractors, top-pan balances, newton meters, analogue or digital electrical meters, measuring cylinders, vernier callipers, micrometer screw gauges and thermometers. [SLO: P-09-A-12] Justify and illustrate the use of common lab instruments to measure length [including how to measure a variety of lengths with appropriate precision using tapes, rulers, micrometers, and Vernier calipers (including reading the scales on analogue calipers and micrometers).
	3. Study the motion of a ball rolling down an angle iron. Measure the time intervals for different distances, and draw a distance-time graph for the ball's motion.	[SLO: P-09-10-N-21] measurement of small distances or short intervals of time. [SLO: P-09-10-N-28] timing motion or oscillations.
	4. Determine the time period of a simple pendulum, and investigate the relationship between length and its time period.	[SLO: P-09-A-14] Justify and illustrate how to measure time intervals using lab instruments [including clocks and digital timers] [SLO: P-09-A-15] Determine an average value for an empirical reading. [including small distance and for a short interval of time by measuring multiples (including the period of oscillations of a pendulum). [SLO: P-09-10-N-18] use a stop-watch to measure intervals of time, including the period of an oscillating system by timing an appropriate number of consecutive oscillations.

		[SLO: P-09-10-N-28] timing motion or oscillations
	5. Determine the specific heat capacity of liquid (water) or a metal (lead) using the method of mixtures.	[SLO: P-09-10-N-26] cooling and heating, including measurement of temperature [SLO: P-10- C-02] Suggest experiments to measure the specific heat capacities [of a solid and of a liquid].
	6. Draw the temperature- time graph for heating ice and water to measure the latent heat of fusion of ice and latent heat of vaporization of water using method of mixtures.	[SLO: P-09-10-N-26] cooling and heating, including measurement of temperature [SLO: P-10-C-27] Justify the experiments to determine the latent heat of fusion and latent heat of vaporization of ice and water [including illustrating the analysis of data by sketching temperature time graph on heating ice]
	7. Study the position of image formed by convex lens (converging lens) when object is placed at different positions in front of it.	[SLO: P-09-10-N-30] optics experiments using equipment such as optics pins, mirrors, prisms, lenses, glass or Perspex blocks (both rectangular and semi- circular), including the use of transparent, translucent and opaque substances to investigate the transmission of light
	8. Study the effect of combining resistors in series and parallel on the total (equivalent) resistance.	[SLO: P-09-10-N-29] electric circuits, including the connection and reconnection of these circuits, and the measurement of current and potential difference
	Section B (40% of practical marks — 12 Marks)	
Minor Practicals	1. Determine the spring constant of a Helical Spring using a load-extension graph.	[SLO: P-09-B-57] Sketch, plot and interpret load—extension graphs for an elastic solid and describe the associated experimental procedures [SLO: P-09-B-58] Define and use the term ‘limit of proportionality’ for a load-extension graph. [Including identifying this point on the graph (an understanding of the elastic limit is not required)]. [SLO: P-09-10-N-22] determining a derived quantity such as the extension per unit load for a spring, the value of a known resistance or the acceleration of an object. [SLO: P-09-B-22] Justify and illustrate the use of a force meter to measure weight. [SLO: P-09-10-N-27] experiments using springs and balances.
	2. Determine the position of centre of gravity of a plane (thin) lamina using plumb line.	[SLO: P-09-B-48] Describe how to determine the position of the center of gravity of a plane lamina using a plumb Line
	3. Determine the volume of irregular shaped insoluble stone by displacement method and calculate its density.	[SLO: P-09-10-N-25] comparing derived quantities such as density. [SLO: P-09-A-13] Justify and illustrate the use of measuring cylinders to measure volume [including both measurement of volume of liquid and determining the volume of a solid by displacement]. [SLO: P-09-B-21] Justify and illustrate the use of electronic balances to measure mass [Understand the internal workings of the electronic balance is not required: just how to practically used instrument in appropriate situations]. [SLO: P-09-10-N-19] use both analogue scales and digital displays. [SLO: P-09-10-N-27] experiments using springs and balances.

4. Studying the laws of reflection using a plane mirror.	[SLO: P-09-10-N-24] comparing measured quantities such as angles of reflection. [SLO: P-09-10-N-30] optics experiments using equipment such as optics pins, mirrors, prisms, lenses, glass or Perspex blocks (both rectangular and semi- circular), including the use of transparent, translucent and opaque substances to investigate the transmission of light
5. Investigate refraction through a glass slab and calculate its refractive index.	[SLO: P-09-10-N-24] comparing measured quantities such as angles of reflection [SLO: P-09-10-N-30] optics experiments using equipment such as optics pins, mirrors, prisms, lenses, glass or Perspex blocks (both rectangular and semi- circular), including the use of transparent, translucent and opaque substances to investigate the transmission of light. [SLO: P-10-D-39] Describe an experiment to show refraction of light by transparent blocks of different shapes.
6. Find critical angle of a prism.	[SLO: P-10-D-40] Define the terms critical angle and total internal reflection.
7. Measure the current and voltage across a resistor and plotting V-I characteristics.	[SLO: P-09-10-N-29] electric circuits, including the connection and reconnection of these circuits, and the measurement of current and potential difference. [SLO: P-10-E-34] Define and apply Ohm's law [Including reference to constant temperature. Use the equation resistance = p.d/current $R = V/I$ to solve simple problems.] [SLO: P-10-E-36] Interpret current-voltage graphs [including for a resistor of constant resistance, a filament lamp and a diode.
8. Identify the relationship between the potential difference across a wire and its length.	[SLO: P-09-10-N-23] testing and identifying the relationship between two variables such as between the potential difference across a wire and its length. [SLO: P-09-10-N-29] electric circuits, including the connection and reconnection of these circuits, and the measurement of current and potential difference.



**Model Questions Paper Physics SSC (COMPOSITE)
FOR ANNUAL EXAMINATION 2027 & ONWARDS
Practical Based Assessment (PBA)
Physics Curriculum (2022-23) - Scheme of Studies 2024**



Total Marks: 30

Time: 2 hours

Note: Attempt all questions and write answers within provided spaces on E-Sheet.

SECTION-A (18 Marks)

Q.1 Consider the series combination of resistances:

- i. Draw and label a circuit diagram of two resistors connected in series along with all necessary circuit components. (02)
- ii. Copy and complete the following table. All the measurements are taken in SI units. (03)

No. of Obs.	Voltmeter Reading		Resistance		Equivalent Resistance R_e	Total Voltage V	Net Current I	Resistance by Ohm's law R	Difference $R_e - R$
SI Units	(---)		(---)		(---)	(---)	(---)	(---)	(---)
	V_1	V_2	R_1	R_2					
	2	10	10	50					
	6	10	60	100					
	4.8	12	80	200					

- iii. What will be effect on the equivalent resistance of the circuit (mentioned in the table) if another resistance is added in series with it? (01)

Q.2 Recall the experiment “motion of a ball rolling down an angle iron” and answer the following questions:

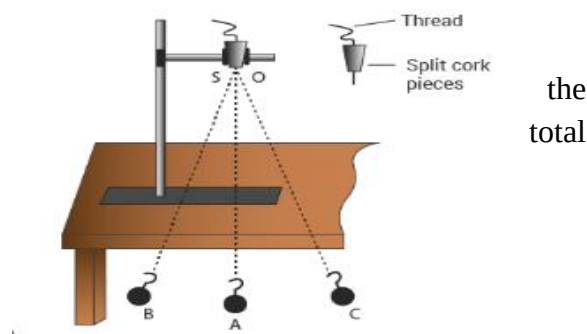
- i. Why is the angle of inclination kept constant throughout the experiment? (01)
- ii. Copy and complete the given table. (02)

	Distance (cm)	Time (s)			Velocity (cm/s)
		t_1	t_2	Mean time t	
1	200	4.4	4.6		
2	180	4.1	4.0		

3	160	3.9	3.3		
4	140	3.2	3.1		
5	120	2.8	2.6		
6	100	2.5	2.0		

- iii. Draw **distance-time graph** by using values from above table. (03)

Q.3 A student is investigating the relationship between length of a simple pendulum and its time period. The diameter of the bob of pendulum is **1.6 cm**. He displaces bob slightly to set it into a steady swing and records the time **t** taken for 20 complete oscillations. The experiment is repeated for different lengths of the pendulum.



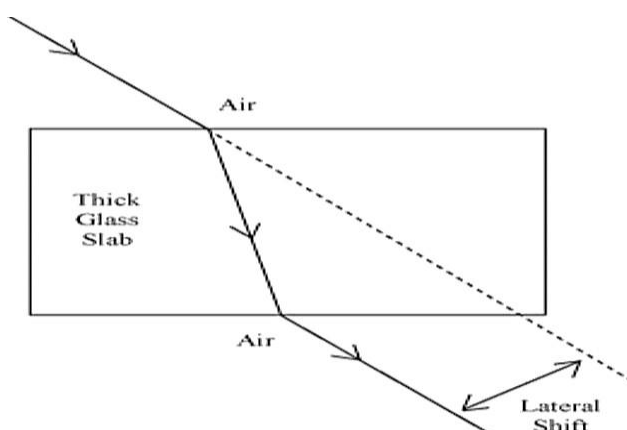
- i. Copy and complete the following table. (03)

length of thread +hook l_1 (cm)	length of pendulum $L = l_1 + r$ (cm)	Time for 20 vibrations t (s)	Time Period $T = \frac{t}{20}$ (s)	$\frac{L}{T^2}$ (cm s ⁻²)
39.2		38.1		
49.2		42.6		
59.2		46.5		

- ii. Name one control variable that must be kept constant in this experiment? (01)
 iii. What should be the shape of the graph between L and T^2 ? (01)
 iv. How can the value of g be determined from the graph? (01)

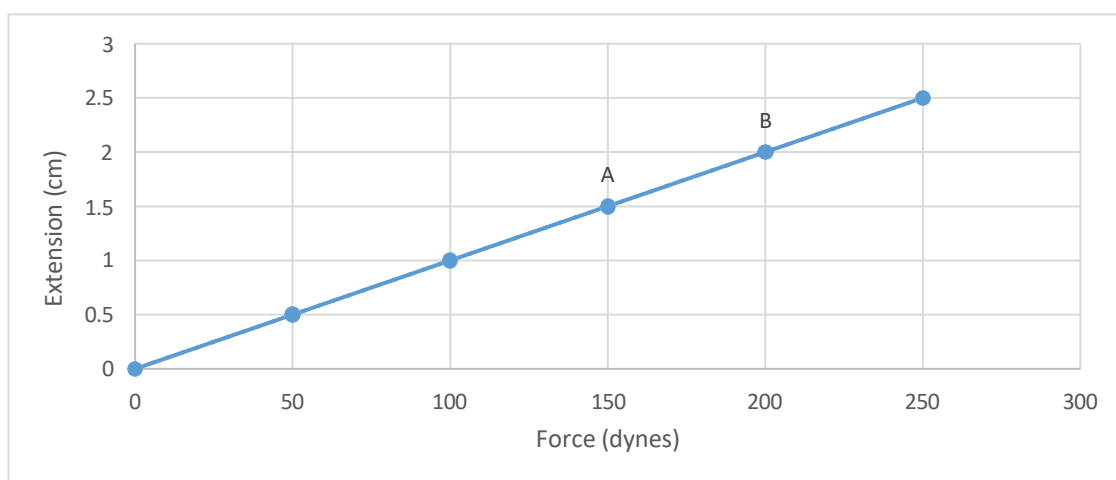
SECTION-B (12 Marks)

Q.4 Consider the experiment of refraction of light through glass slab and answer the following questions:



- i. Find angle of incidence and angle of refraction from figure given in Q 4. (02)
 ii. Calculate refractive index of the glass. (02)

Q.5 The given graph shows the extension in the helical spring by increasing the attached load.



- i. Name the dependent variable and independent variable used in above graph. (01)
- ii. Calculate the slope from force-extension graph by taking points A and B. (02)
- iii. Which quantity is represented by the slope of force-extension graph? (01)

Q.6 A student studies the relationship between the potential difference across a wire of uniform resistance R and its length L , keeping the current constant.

- i. Draw the labelled circuit diagram used for this experiment. (2)
- ii. Copy and complete the following table. (2)

No. of observations	Length L (cm)	Potential difference V (volts)	Current I (A)	Resistance $R=V/I$ (Ω)
1	25	0.5	0.1	
2	50	1.0	0.1	
3	75	1.5	0.1	
4	100	2.0	0.1	



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