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

No.1-10/FBISE/RES/334 14 March, 2025

NOTIFICATION

Assessment Frameworks for Practical Based Assessment (PBA) containing lists of experiments/praticals along with instructions and Model Question Papers (Composite) in the subjects of Physics, Chemistry, Biology and Computer Science at SSC and HSSC levels based on National Curriculum of Pakistan 2022-23 (Scheme of Studies 2006) are hereby notified for implementation with effect from Annual Examinations 2026 and onwards.

2. The Assessment Frameworks for Composite PBA (Scheme of Studies 2006) are available at FBISE website. The weblink is **https://www.fbise.edu.pk/curriculum_model_paper.php .**

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Heads of all Institutions affiliated with FBISE
at SSC & HSSC levels

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ASSESSMENT FRAMEWORK

FOR PRACTICAL BASED ASSESSMENT (PBA) - COMPOSITE

PHYSICS

HSSC LEVEL

NATIONAL CURRICULUM OF PAKISTAN (2022-23)

SCHEME OF STUDIES 2006

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) have developed the Assessment Framework (AF) for the Practical Based Assessment (PBA) of Physics at the Higher Secondary School Certificate (HSSC) 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 HSSC 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. Dr. Munazza Faheem, Associate Professor, Islamabad Model College for Girls, F-6/2, Islamabad
2. Dr. Humaira Anwar, Associate Professor, Islamabad Model College for Girls, F-7/4, Islamabad
3. Mr. Muhammad Jahangir Mirza, HOD Physics, OPF College for Boys, H-8/4 Islamabad
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6. Mr. Muhammad Imran Khaliq, Assistant Professor, Islamabad Model College for Boys, G-10/4, Islamabad
7. Ms. Sehrish Imran, Lecturer, Islamabad Model College for Girls, I-8/4, Islamabad

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)
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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 separately composed Assessment Frameworks for Classes HSSC-I and HSSC-II. Subsequently, all the SLOs of HSSC-I and HSSC-II meant for summative PBA have been translated into workable and functional composite lists of major and minor experiments which are part of this booklet. This extraction of lists of experiments helps in effectively measuring student progress and understanding of the scientific concepts linked with laboratory work. These experiments 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 experiments 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 experiments (major and minor).

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

Guidelines/instructions for Students/Teachers/Paper Setters

i. The paper will consist of two sections i.e section A and B.

ii. Section A will include Major Practicals. This section will have three questions, each question carrying 6 marks having parts in it, and each question will be performance / calculation/procedures/observations based encompassing a single practical.

iii. Section B will include Minor Practicals. This section will also have three questions, each carrying 4 marks having parts in it. Each question may be based on single or multiple practicals.

iv. The weightage of section A will be 60% i.e 18 marks, while that of section B will be 40 % i.e 12 marks.

v. In Practical Based Assessment (PBA), there will be 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 may 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 marks will not be included/assessed as single part in any section of the PBA paper.

List of Experiments aligned with SLOs (Composite PBA)
For HSSC Annual Examination 2026 & onwards
Physics Curriculum (2022-23) - Scheme of Studies 2006

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)		
No.	**List of Experiments**	**Aligned SLOs**
Major Practicals	1. Measure the volume of a small spherical object using screw gauge and calculate the uncertainty in the result.	[SLO: P-11-A-05] Analyze and critique the accuracy and precision of data collected by measuring instruments. [SLO: P-11-A-06] Assess the uncertainty in a derived quantity [By simple addition of absolute, fractional or percentage uncertainties] [SLO: P-12-N-06] Show uncertainty estimates, in absolute terms, beside every value in a table of results
	2. Determine the radius of curvature of convex lens using a spherometer and calculate uncertainty in the result.	[SLO: P-11-A-05] Analyze and critique the accuracy and precision of data collected by measuring instruments. [SLO: P-11-A-06] Assess the uncertainty in a derived quantity [By simple addition of absolute, fractional or percentage uncertainties] [SLO: P-12-N-15] Calculate uncertainty estimates in derived quantities
	3. Investigate the fall of spherical steel ball through a viscous medium and determine Coefficient of viscosity of the fluid.	[SLO: P-11-B-42] Describe how viscous forces in a fluid cause a retarding force on an object moving through it.
	4. Study stationary waves using Melde's apparatus and calculate the frequency of AC source.	[SLO:P-11-D-12] Explain the formation of harmonics in stationary waves.
	5. Determine the wavelength of sound in air using stationary waves and to calculate the speed of sound at 0^{o}C using resonance tube.	[SLO:P-11-D-10] Illustrate experiments that demonstrate stationary waves [using microwaves, stretched strings and air columns (it will be assumed that end corrections are negligible; knowledge of the concept of end corrections is not required)].
	6. Compare the emf of cells using potentiometer.	[SLO: P-11-E-23] State and use the principle of the potentiometer as a means of comparing potential differences.
	7. Determine the time period, frequency and angular frequency of simple pendulum by varying its length.	[SLO: P-11-D-03] Express the period of simple harmonic motion in terms of both frequency and angular frequency.
	8. Determine the relation between current and capacitance for different combinations of capacitors in AC circuits.	[SLO: P-12-E-06] use the capacitance formula for capacitors in series and in parallel. [SLO:P-12-E-25] Calculate the reactance of capacitors and inductors.
	9. Study the charging and discharging of a capacitor through a resistor and calculate the time constant.	[SLO: P-12-E-08] Analyze graphs of the variation with time of potential difference, charge and current for a capacitor discharging through a

		resistor [use τ = RC for the time constant for a capacitor discharging through a resistor]
	Section B (40% of practical marks 12 Marks)	
Minor Practicals	1. Calculate elastic potential energy from the load-extension graph for vertical mass spring system.	[SLO: P-11-B-28] Determine the elastic potential energy of a material. [that is deformed within its limit of proportionality from the area under the force-extension graph. Also state and use Ep = 1/2 (kx^2) for a material deformed within its limit of proportionality]. [SLO: P-11-B-30] Deduce the work done from force-displacement graph.
	2. Sketch magnetic field pattern due to the currents in a long straight wire/ a flat circular coil/ a long solenoid.	[SLO: P-09-E-35] Sketch magnetic field patterns due to the currents in a long straight wire, a flat circular coil and a long solenoid.
	3. Investigate the value of 'g' by free fall method using electronic timer.	[SLO: P-12-B-07] Analyze why g is approximately constant for small changes in height near the Earth's surface.
	4. Study the input and output waveforms for half wave rectification using CRO. (Questions will not be asked from CRO)	[SLO: P-12-E-19] explain the use of a single diode for the half-wave rectification of an alternating current.
	5. Study the input and output waveforms for full wave rectification using CRO. (Questions will not be asked from CRO)	[SLO: P-12-E-20] explain the use of four diodes (bridge rectifier) for the full-wave rectification of an alternating current.
	6. To study variation of electric current with intensity of light using photoelectric apparatus.	[SLO: P-12-F-06] describe that photoelectron may be emitted from a metal surface when it is illuminated by electromagnetic radiation. [SLO: P-12-F-07] Describe and use the terms threshold frequency and threshold wavelength [SLO: P-12-F-08] Explain photoelectric emission in terms of photon energy and work function energy [SLO: P-12-F-09] State and apply $hf = \emptyset + \frac{1}{2} \text{m } V^2_{max}$ [SLO: P-12-F-10] Explain why the maximum kinetic energy of photoelectrons is independent of intensity, whereas the photoelectric current is proportional to intensity

MODEL PHYSICS PBA PAPER (COMPOSITE HSSC)
For HSSC Annual Examination 2026 & onwards
Physics Curriculum (2022-23)-Scheme of Studies 2006

Total Marks: 30 Time: 2:30 hours

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

SECTION-A (18 Marks)

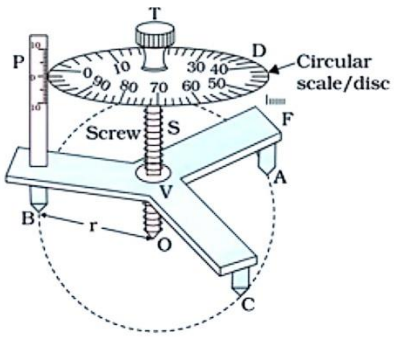
Q.1 The potentiometer is used to determine the internal resistance of a cell in the lab.

i. What is the principle behind using a potentiometer to measure internal resistance? (01)
ii. Why is the **potentiometer** preferred for measuring internal resistance of a cell? (01)
iii. Table below shows some values obtained using the null deflection method. Copy and complete the missing entries in the given table. (03)

No of obs	Resistance R	Length of balance point without R. (l_1)	Length of balance point with R (l_2)	Difference of lengths	Internal resistance r
Units	(---)	(---)	(---)	(---)	(---)
1	3	223		97	
2	5	236		56	
3	7	227		31	

iv. How do you determine the emf of cell using potentiometer? (01)

Q. 2. Figure shows a spherometer used to measure radius of curvature of a convex surface



i. If the pitch of the spherometer is 1 mm and there are 100 divisions on its disc, what its least count? (01)
ii. This spherometer gives a mean height of 2.42mm when placed on plane glass plate. Now it is placed on a convex surface. The distance between any two outer legs is 4 cm.

Main scale reading **a**	Circular scale reading **b** (cm)		Total reading = **a** + **b** (in cm)
	Circular scale division touching the edge of the main scale	Circular scale division x least count (in cm)	
2 mm (----cm)	63		

a. Copy and complete the table. (01)
b. Calculate height of spherical surface. (01)
c. Find the perimeter of equilateral triangle formed by the legs of spherometer. (01)
d. What is the radius of the curvature of the spherical surface? (02)

Q.3. Study the charging and discharging of a capacitor through a resistor and calculate the time constant.

A student aims to calculate the time constant for a capacitor which is marked as 4**00 µF**. He connects a 20 **KΩ** resistor and a battery of 12 **V** in series with the capacitor. He also connects a voltmeter in parallel with the capacitor and a two-way switch to charge and discharge the capacitor.

Table below shows the values obtained when the capacitor was discharged from its peak voltage.

Time (s)	3	6	9	11	15	18	22	25
Voltage (V)	14	7	4	2	0.8	0.6	0.3	0.3

i. Draw the circuit diagram of the experimental arrangement. (01)
ii. Draw a graph from the given values and also determine the time constant from this graph. (03)
iii. What is the actual value of the time constant? Also calculate the percentage error in your calculated time constant. (02)

SECTION-B (12 Marks)

Q.4. Investigate the value of 'g' by free fall method using electronic timer.

With the help of electronic timer, students measure the distance and time of free fall by repeating procedures with same steel ball for different heights and recorded readings given in following table.

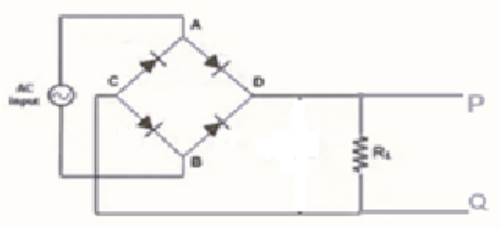
i. Copy and complete the table. (02)

No. of obs.	Height (h) (cm)	Time (s)		Average (t) (s)	g = ------ (----)
		t_1	t_2		
1	28	0.24	0.22		
2	47	0.31	0.29		
3	67	0.37	0.38		
4	72	0.39	0.40		
5	76	0.40	0.42		
6	80	0.44	0.41		

ii. Calculate the mean value of g and percentage error in g. (01)

iii. How can we magnetize steel ball in this experiment? (01)

Q.5. A circuit shows a rectifier bridge connected to an AC supply. The terminals P and Q are connected to CRO circuit.



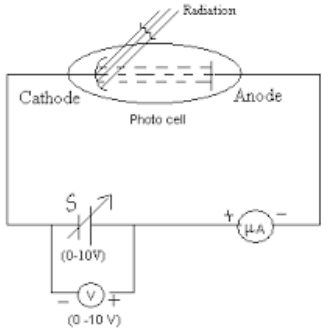
i. Draw the waveform obtained at output PQ. (01)

ii. At output PQ (from CRO) peak value of voltage 'V' is 8V. What is its r.m.s value? (02)

iii. Calculate the power dissipated in resistor if resistance 'R' is 4Ω. (01)

Q.6. To study variation of electric current with intensity of light using photoelectric apparatus.

A schematic diagram is shown below to study the variation in electric current with the intensity of light using photocell. Data is recorded and mentioned in the table where "d" is the distance of a light source from the photocell and "I" is the current flowing in the circuit.



i. Copy and complete the table (02)

No. of obs	Distance (d) (cm)	Current (I) (μA)	Intensity of light (---)
1	60	15	
2	50	25	
3	40	55	
4	30	70	
5	20	115	
6	10	240	

ii. Plot the graph between current and intensity of light. (02)

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