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

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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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at SSC & HSSC levels

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ASSESSMENT FRAMEWORK

FOR PRACTICAL BASED ASSESSMENT (PBA) - COMPOSITE

CHEMISTRY

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 Chemistry at the 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 Chemistry 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. Shaista Sabir, Associate Professor, PAEC Model College for Girls, Nilore, Islamabad
2. Mr. Naeem Mushtaq, Associate Professor, Islamabad Model College for Boys, G-10/4, Islamabad
3. Mrs. Adeela Asim, Assistant Professor, Islamabad Model College for Girls, F-7/2, Islamabad
4. Ms. Javeria Gul, HOD Chemistry, Pak Turk Muaarif International School, Islamabad
5. Mrs. Aliya Sajid, Lecturer, Army Public School & College, Pasban, 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 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
Chemistry 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.** Determine the exact molarity of the given solution of H_2SO_4 and the volume of this acid required to Prepare 500 ml of 0.02 M Acid by Volumetric Method. **2.** The given solution contains 6gms of Na_2CO_3 dissolved per dm^3. Determine the Percentage Purity of the Sample Solution by Volumetric Method. **3.** Determine the Value of 'X' by volumetric method in the given sample of 6.3g of $(COOH)_2.XH_2O$ Dissolved per dm^3.	**SLO: C-12-G-05** Use the following types of titrations as examples: acid-alkali titration (this could be weak or strong acid and weak or strong alkali).
		SLO: C-11-B-145 Perform acid-base titrations to calculate molarity and strength of given sample solutions.
		SLO: C-11-B-146 Select suitable indicators for acid-alkali titrations, given appropriate data (pKa values will not be used).
		SLO: C-12-G-08 Carry out titrations until concordant results are obtained.
		SLO: C-12-G-09 Identify and use appropriate indicators in the titration.
		SLO: C-11-G-23 Show working in calculations and key steps in reasoning.
		SLO: C-11-G-24 Use the correct number of significant figures for calculated quantities.
		SLO: C-11-G-25 Draw an appropriate table in advance of taking readings or making observations and record all data in the table.
		SLO: C-11-G-29 Describe the patterns and trends shown by data in tables and graphs.
		SLO: C-11-G-30 Describe and summarize the key points of a set of observations.
		SLO: C-11-G-32 Draw conclusions from an experiment, giving an outline description of the main features of the data, considering whether experimental data support a given hypothesis, and making further predictions.

	4. Standardize the given solution of $KMnO_4$ by using compound of Iron(II) and calculate the volume of $KMnO_4$ required for preparing 1 dm^3 of 0.01M $KMnO_4$ solution volumetrically. **5.** Determine the strength of oxalic acid in 500cm^3 of its solution by titrating it against a standard solution of Potassium	**SLO: C-12-G-05** Use the following types of titrations as examples: Potassium manganate (VIl) titration with hydrogen peroxide, Iron((Il) ions, nitrite ions or ethanedioic acid or its salt. **SLO: C-12-C-33** Analyze reactions involving MnO_4^{2-}/ Fe^{2+}, in acid solution given suitable data (including describing the reaction and doing calculations).
	manganate (VII), $KMnO_4$ in an acidic medium.	**SLO: C-12-C-34** Analyse reactions involving MnO_4^{1-}/ Fe^{2+} in acid solution given suitable data (including describing the reaction and doing calculations).
	6. Estimate the amount of iodine in a given solution by titrating it with standard solution of sodium thiosulfate, $Na_2S_2O_3$ using starch as an indicator.	**SLO: C-12-G-05** Use the following types of titrations as examples: Sodium thiosulfate and iodine titration. **SLO: C-12-C-36** Perform calculations involving other redox systems given suitable data.
	7. Describe tests to identify the following anions. SO_4^{2-}, SO_3^{2-}, CO_3^{1-}, Cl^{1-}, Br^{1-}, I^{1-}, NO_3	**SLO: C-11-G-20** Describe tests to identify the anions: **a**. CO_3^{2-}: By reaction with dilute acid and then testing for carbon dioxide gas. **b**. Cl^{1-} / Br^{1-} / I^{1-} : By acidifying with dilute nitric acid then adding aqueous silver nitrate. **c.** NO_3^{1-} : By reduction with aluminum foil and aqueous sodium hydroxide and then testing for ammonia gas. **d**. SO_4^{2-} : By acidifying with dilute nitric acid then adding aqueous barium nitrate. **e**. SO_3^{2-} : By reaction with acidified aqueous Potassium manganate(VII). **SLO: C-11-C-27** Describe the reaction of halides with aqueous silver ions followed by aqueous ammonia.
	8. Describe dry/ wet tests to identify the following cations by using reagents such as aqueous sodium hydroxide and aqueous ammonia. Cu^{2+}, Fe^{2+}, Fe^{3+}, Ca^{2+}, Al^{3+}, Cr^{3+}, Zn^{2+}, NH_4^{1+}	**SLO: C-11-G-21** Describe tests using aqueous sodium hydroxide and aqueous ammonia to identify the aqueous cations: **a)** aluminum Al^{3+} **b)** ammonium, NH_4^{1+} **c)** calcium, Ca^{2+} **d)** chromium(III), Cr^{3+} **e)** copper(II), Cu^{2+} **f)** iron(II), Fe^{2+} **g)** iron(III), Fe^{3+} **h)** zinc, Zn^{2+}

		SLO: C-12-G-19 Understand the appropriate methods to be used when carrying out qualitative analysis tests: • to treat all unknown materials with caution • to use an appropriate quantity of the material under test • to add only the specified amount • to work safely, e.g. to use a test-tube holder when heating a solid in a hard-glass test-tube • to record all observations, even when this is 'no change' or 'remains a colourless solution' • to use excess alkali where a precipitate is produced on addition of NaOH(aq) or NH_3 (aq) to determine its solubility • to identify a gas whose formation is shown by effervescence.
	Section B (40% of Practical Marks — 12 Marks)	
Minor Practicals	**1.** Prepare Iodoform by using ethanol. (Name of reagents, lab apparatus and chemical equation is required).	**SLO: C-12-G-20** Perform the following organic analysis tests and functional group present: The production of a yellow precipitate with alkaline aqueous iodine to indicate the presence of the CH_3CO or $CH_3CH(OH)$ group
	2. Identify Aldehyde and Ketone functional Group by using Fehling solution and tollen's reagent.	**SLO: C-12-G-20** Perform the following organic analysis tests and functional group present: • The production of an orange/red precipitate with Fehling's reagent to indicate the presence of the aldehyde functional group the production of a silver mirror/black precipitate with Tollens' reagent to indicate the presence of the aldehyde functional group
	3. Perform an organic analysis test to identify the presence of compound such as alkene or alcohol by observing the change in colour of acidified $KMnO_4$ solution from purple to colourless, indicating oxidation.	**SLO: C-12-G-20** Perform the following organic analysis tests and functional group present: The change in colour of acidified Potassium manganate(VIl) $KMnO_4$ from purple to colourless to indicate the presence of a compound that can be oxidized.
	4. Identify the Phenol Functional Group.	**SLO: C-12-E-27** Recall the chemistry of phenol, as exemplified by the following reaction with Br_2(aq) to form 2,4,6-tribromophenol.
	5. Estimate the Amount of Ba^{2+} in the Given Solution of $BaCl_2$ Gravimetrically.	**SLO: C-12-G-12** Prepare a sample for gravimetric analysis.
		SLO: C-12-G-13 Perform gravimetric analysis using appropriate techniques (may include precipitation and filtration).

	6. Investigating the rate of reaction by measuring the volume of gas produced.	**SLO: C-11-G-27** Plot appropriate variables on appropriate, clearly labelled x- and y-axes with carefully chosen scales.
		SLO: C-11-G-28 Draw straight lines or smooth curves of best fit to show the trend of a graph.
		SLO: C-12-G-10 Carry out rate investigation by mixing reagents and recording the time for an observation to occur.

Model Question Paper Chemistry HSSC (COMPOSITE)
For Annual Examination 2026 & onwards
Practical Based Assessment (PBA)
Chemistry Curriculum (2022-23)-Scheme of Studies 2006

Total Marks: 30 Time: 2 hours 30 minutes

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

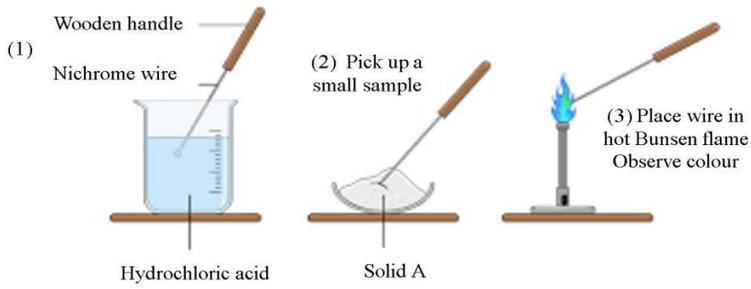
SECTION A (6 x 3 = 18)

Note: Attempt all questions and write answers within provided spaces.

Q No.1. Two solids **A** and solid **B**, were analysed. **A** was Barium chloride. Tests were done on **A** and **B**.

(a) Tests on A

Complete the expected observations.



(i) A Student performs a flame test '**A**'. What is the flame colour observed? [1]

(ii) Specific amount of **A** was added to distilled water to prepare its solution in a test-tube. Divide **A** into two equal portions in two test-tubes.

(iii) To the first portion of solution **A**, add aqueous silver nitrate followed by a few drops of dilute solution of aqueous ammonia. Write its observation. [1]

(iii) To the second portion of solution **A**, add dilute sulfuric acid. Write its observation. [1]

(b) Tests on B

Specific amount of **B** was added to distilled water to prepare its solution in a test-tube. Students' divide this solution into two portions.

Following table shows the tests and the student's observations for **compound B**.

Table

Tests	Observations
Test 1 Appearance of **B**	light green colour
Test 2 An excess of aqueous sodium hydroxide was added to the first portion of solution **B**.	Green ppts are formed which remain insoluble in excess of sodium hydroxide.
Test 3 Dilute nitric acid and aqueous barium nitrate were added to the second portion of solution **B**.	White ppts are formed.

(i) Name the cation present in solution B. [1]

(ii) Write down formula of the precipitates formed in test 2. [1]

(iii) Write the name of **B**. [1]

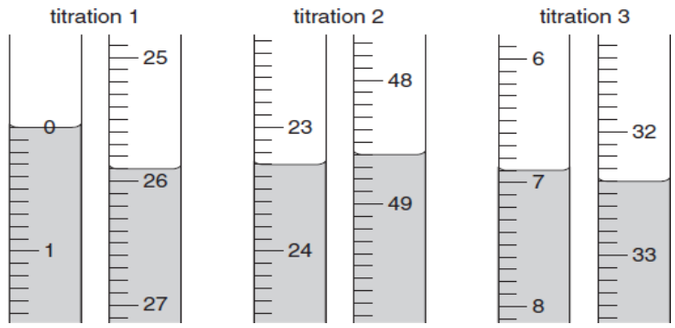
Q No. 2. The formula for iron (II) sulphate crystals is $FeSO_4.xH_2O$, where *x* is a whole number.

A student determined the value of '***x***' using 0.0200 M Potassium manganate (VII). This was solution **A**.

28g of a given sample of $FeSO_4.xH_2O$ is dissolved per dm^3 of solution. This was solution **B**.

(a) A 25.0 cm^3 sample of solution **B** followed by half test tube of sulfuric acid was measured into the titration flask. Solution **A** was run from a burette into the flask containing Solution **B** until an end-point was reached. What was the colour change at the end point? [1]

(b) Three titrations were done. The diagrams below show parts of the burette before and after each titration.



Use these diagrams to complete the table of results. [2]

Titration number	1	2	3
Final reading (cm^3)			
First reading (cm^3)			
Volume of solution A used			
Best titration result (✓)			

Summary.

Tick (✓) the best titration results. Using these results, the average volume of **A** was ..... cm^3.

When acidified $KMnO_4$ reacts with hydrated Iron (II) sulfate, $FeSO_4.xH_2O$ the following reaction occurs:

$2KMnO_4 + 10FeSO_4.xH_2O + 8H_2SO_4 \rightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 8H_2O$

(c) Calculate molarity of hydrated iron (II) sulfate by using the chemical equation and above data. [2]

(d) By using your answer to **(c)** and the strength of hydrated Iron (II) sulfate, calculate the value of 'x' (water of crystallization) in $FeSO_4.xH_2O$. [1]

Q No. 3. A 25 cm^3 solution of iodine was titrated with 0.1 $moldm^{-3}$(molarity) solution of sodium thiosulfate. The titration required 15.5 cm^3 of sodium thiosulfate solution to reach the end point.

(a). Write balanced equation for the reaction between iodine and sodium thiosulfate. [1]

(b). Name the indicator used in this titration. Describe the change in colour that occurs when the end point of the titration is reached. [2]

(c). Calculate the moles of sodium thiosulfate used in the titration. [1]

(d). Use your answer to **(c)**, calculate the concentration (molarity) of iodine in $moldm^{-3}$. [2]

SECTION B (4 x 3 = 12)

Note: Attempt all questions and write answers within provided spaces.

Q No. 4(a). Write down the chemicals required for the preparation of iodoform. Also write the chemical equation involved. [1+1]

(b). Write the observation for identification of phenol. Also write down the chemical equation involved. [1+1]

Q No. 5 (a). Explain how to identify the presence of aldehyde in a mixture of aldehyde and ketone. Provide chemical equation for the reaction involved. [1+1]

(b) Describe the set up required to measure the rate of reaction by collecting the volume of gas produced. Draw a diagram and label the apparatus used. [1+1]

Q No. 6. A student performed an experiment to test for the presence of an organic compound that can be oxidised using acidified potassium manganate (VII) $KMnO_4$.

(a). What colour change in $KMnO_4$ shows that a compound can be oxidised? [1]

(b). Name one organic compound that can be detected using this test. [1]

(c). How does the oxidation state of Manganese change in acidified Potassium manganate (VII) during this reaction? [2]

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