

ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

CHEMISTRY

Grade IX

NATIONAL CURRICULUM

2022-23



50% MCQs & 50% Descriptive
INCLUSIVE SCHEME OF STUDIES 2024



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**ASSESSMENT FRAMEWORK
FOR
CHEMISTRY GRADE-IX
CURRICULUM 2022-23
SCHEME OF STUDIES 2024**

ACKNOWLEDGEMENT

It is a great honour that we, at the Federal Board of Intermediate and Secondary Education, have developed the Assessment Framework (AF) for the subject of Chemistry for Grade-IX. The primary objective of the AF is to optimize the current curriculum 2022-23. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes for Grade-IX Chemistry curriculum. They evaluated these outcomes in terms of their scope, cognitive level, and progression across the grade.

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 will serve as a guiding document for students, teachers and paper setters. Students will receive clear directions for preparing themselves for the annual examination. Similarly, teachers will use it as a guide to understand what to teach in class and to prepare students for the final examinations accordingly. Similarly paper setters will also seek guidance from this document.

Following subject as well as assessment experts/committee members remained constantly engaged in the development of the AF:

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. Mr. Amir Muhammad, Assistant Professor, Islamabad Model College for Boys I-8/3, Islamabad
4. Ms. Javeria Gul, HOD Chemistry, Pak Turk Muararif International School, Islamabad
5. Ms. Ambreen Tassawar, 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 a pivotal and leading role in finalizing the Assessment Framework.

MIRZA ALI
Director
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR CHEMISTRY GRADE-IX, CURRICULUM 2022-23

To ensure clarity and precision in assessment, the learning outcomes have been categorized into two distinct groups: formative and summative. This classification helps in effectively measuring student progress and understanding. Each Student learning outcome (SLO) has been carefully marked as either formative or summative within the newly developed Assessment Framework. SLOs of Summative Assessment Format will be part of the Final Examination while SLOs of Formative Assessment will although be part of the teaching-learning activity but they will **NOT** be part of Final Examinations. Estimated cognitive levels i.e Knowledge (K), Understanding (U) and Application (A) of all the SLOs have also been indicated. It may be noted that all the higher cognitive levels have been collectively accumulated in the cognitive level of 'Application'. In subjects involving Practicals (Lab work), it has been mentioned categorically whether an SLO is summative for theory or summative for Practical Based Assessment (PBA). If an SLO is summative for PBA, it means that Laboratory work is required in the teaching-learning activity and it will be part of the Practical Examination/ Practical Based Assessment.

The Assessment Framework will act as a comprehensive guide for students, teachers and paper setters. Students will have clear instructions on how to prepare for the annual examinations. Teachers will use the framework to understand the curriculum and effectively prepare their students for the final examination. Additionally, paper setters will refer to this document for guidance in setting examination papers.

A model question paper has also been developed to provide a clear structure and format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of what to expect in their examinations. By aligning the paper with the Student Learning Outcomes (SLOs) of the curriculum, we ensured that the questions accurately reflect the skills and knowledge that students are expected to acquire.

A detailed Table of Specifications (ToS) has been created to ensure equitable coverage of cognitive levels and content domains in order to generate a balanced question paper. The ToS serves as drawing scale and action plan for the question paper, ensuring that all important areas of the curriculum are adequately and proportionately assessed.

FORMATIVE ASSESSMENT: AN ESSENTIAL COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a pivotal element in the educational process, distinguished by its role in providing ongoing feedback to both students and educators. Unlike summative assessments, which evaluate student learning at the end of an instructional period, formative assessments are integrated into the learning process to monitor student understanding and guide instructional decisions.

The primary objective of formative assessment is to identify learning gaps and misunderstandings as they occur, enabling timely interventions. This dynamic approach allows teachers to adjust their teaching strategies to better meet the needs of their students. For instance, if a teacher notices through a quick quiz or class discussion that a significant portion of the class struggles with a particular concept, they can revisit that topic, providing additional explanations or alternative methods of instruction. This adaptability is crucial for fostering a deeper understanding of the material.

Formative assessments come in various forms, ranging from informal methods like classroom discussions, observations, and questioning, to more structured approaches such as quizzes, peer assessments, and self-reflections. These methods are not limited to paper-and-pencil tasks but can include digital tools that provide instant feedback. The versatility of formative assessments allows educators to cater to diverse learning styles and preferences, ensuring that all students are engaged and supported in their learning journey.

Formative assessment plays a significant role in creating a supportive classroom environment. It shifts the focus from merely achieving grades to understanding the learning process. This approach reduces the pressure on students, as they perceive assessments not as a final judgment of their abilities but as a part of their learning journey. Consequently, formative assessment can lead to increased student motivation and engagement.

In conclusion, formative assessment is a powerful tool that, when effectively implemented, can significantly enhance the learning experience. It provides invaluable insights for both teachers and students, promotes a growth-oriented learning environment, and supports the continuous development of essential skills. As education evolves, the role of formative assessment will undoubtedly continue to be central in fostering successful and meaningful learning experiences.

SUMMATIVE ASSESSMENT: EVALUATING LEARNING OUTCOMES IN THE FORM OF TERMINAL/FINAL EXAMINATION

Summative assessment is a fundamental component of the educational process, designed to evaluate student learning at the conclusion of an instructional period. Unlike formative assessment, which provides ongoing feedback during the learning process, summative assessment serves as a final measure of what students have learned. Typically administered at the end of a unit, course, or academic year. Summative assessment aims to determine the extent to which educational objectives have been achieved.

The primary purpose of summative assessment is to assess the overall effectiveness of instruction and learning. It provides a conclusive evaluation of student performance, often in the form of tests, final projects, or standardized exams. These assessments generate grades or scores that reflect a student's achievement in a given subject area over a specific period or time duration.

Summative assessment is often used to make critical decisions regarding student progression, certification, or placement in subsequent educational levels. Additionally, summative assessments provide valuable data that inform curriculum development and instructional strategies. By analyzing summative assessment results, educators can identify trends, strengths, and weaknesses within their instructional approaches, allowing for improvements in future teaching.

In conclusion, summative assessment plays a critical role in the educational process by providing a final evaluation of student learning. While it differs from formative assessment in its focus and application, it is an essential tool for measuring academic achievement. When balanced with formative assessments, summative assessments contribute to a well-rounded and effective approach to evaluating and supporting student learning.

National Curriculum of Pakistan 2022-2023
Assessment Framework Chemistry
Details of Content Area/ SLOs -----Grade-IX (SSC-I)

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
A	Nature of Science in Chemistry	SLO: C-09-A-01	Define chemistry as the study of matter, its properties, composition and interactions with other matter and energy or study of Earth (solids), Air (gases), Sea (liquids) and sky (plasma) and their interaction with each other.	Knowledge	Summative	Question(s) will be asked in annual examination.	04
		SLO: C-09-A-02	Explain with examples that chemistry has many sub-fields and example, and interdisciplinary fields. (Some examples includes). Biochemistry. Medicinal Chemistry. Polymer Chemistry. Geochemistry. Environmental Chemistry. Analytical Chemistry. Physical Chemistry. Organic Chemistry. Inorganic Chemistry. Nuclear Chemistry. Astrochemistry).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-A-03	Formulate examples of essential question(s) that are important for the branches of Chemistry. e.g. for Analytical Chemistry a question would be 'how can we accurately determine the chemical composition of a sample?')	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-A-04	Differentiate between 'science', 'technology' and 'engineering' by making reference to examples from the physical sciences. (Science is a process of exploring new knowledge methodically through observation and experiments, technology refers to the process of applying scientific knowledge in practical applications, for various purposes. Engineering is the application of knowledge in order to design, build and maintain a product or a process. that solves a problem and fulfills a need. Science provides the fundamental knowledge and understanding whole engineering applies that knowledge to develop practical solutions.	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
B	Matter	SLO: C-09-B-01	Define matter as a substance having mass and occupying space.	Knowledge	Summative	Question(s) will be asked in annual examination	07
		SLO: C-09-B-02	State the distinguishing macroscopic properties of commonly observed states of solids, liquids and gasses in particular density, compressibility and fluidity.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-03	Identify that state is a distinct form of matter (examples could include familiarity with plasma, intermediate states and exotic states e.g. BEC or liquid crystals).	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-04	Explain the allotropic forms of solids(some examples may include diamond, graphite, and fullerenes)	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-05	Explain the differences between elements, compounds and mixtures.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-06	Identify solutions, colloids, and suspensions as mixtures and give an example of each.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-07	Explain the effect of temperature on solubility and formation of unsaturated and saturated solutions.	Understanding	Summative	Question(s) will be asked in annual examination.	
	Atomic structure	SLO: C-09-B-08	Explain the structure of the atom as a central nucleus containing neutrons and protons surrounded by electrons in shells.	Understanding	Summative	Question(s) will be asked in annual examination.	13
		SLO: C-09-B-09	State that, orbits (shells) are energy levels of electrons and a larger shell implies higher energy and greater average distance from nucleus.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-10	State that electrons are quantum particles with probabilistic paths whose exact paths and locations cannot be mapped (with reference to the uncertainty principle).	Knowledge	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-B-11	Explain that a nucleus is made up of protons and neutrons held together by strong nuclear force.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-12	Explain that an atomic model is an aid to understand the structure of an atom.	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching	
		SLO: C-09-B-13	State the relative charge and relative masses of a subatomic particles (an	Understanding	Summative	Question(s) will be	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
			electron, proton and neutron).			asked in annual examination.	
		SLO: C-09-B-14	Interpret the relationship between a subatomic particle, their mass and charge	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-15	Illustrate the path that positively and negatively charged particles would take under the influence of a uniform electric field.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-16	Define proton number/atomic number as the number of protons in the nucleus of an atom.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-17	Explain that the proton number is unique to each element and used to arrange elements in periodic table.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-18	State that radioactivity can change the proton number and alter an atom's identity.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-19	Define nucleon number/atomic mass as sum of number of protons and neutrons in the nucleus of an atom.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-20	Define isotopes as different atoms of the same element that have same number of protons but different neutrons	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-21	State that isotopes can affect molecular mass but not chemical properties of an atom.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-22	Determine the number of protons and neutrons of different isotopes.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-23	Define relative atomic mass as the average mass of isotopes of an element compared to 1/12th of mass of an atom of Carbon-12.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-24	State that isotopes can exhibit radioactivity.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-25	Discuss the importance of isotopes using carbon dating and medical imaging as examples.	Application	Summative	Question(s) will be asked in annual	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
						examination.	
		SLO: C-09-B-26	Describe the formation of positive (cation) and negative (anion) ions from atoms.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-27	Interpret and use the symbols for atoms and ions.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-28	Calculate relative atomic mass of an element from relative masses and abundance of isotopes.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-29	Calculate relative atomic mass of an element from relative masses and abundance of all stable isotopes.	Application	Summative	Question(s) will be asked in annual examination.	
	Chemical Bonding	SLO: C-09-B-30	Describe that noble gas electronic configuration, octet and duplet rules help predict chemical properties of main group elements.	Understanding	Summative	Question(s) will be asked in annual examination.	09
		SLO: C-09-B-31	Compare between the formation of cations and anions.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-32	Account for the electropositive and electronegative nature of metals and non-metals.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-33	Define ionic, covalent, coordinate covalent and metallic bonds.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-34	Differentiate between ionic compounds and covalent compounds.(The following points need to be included in the respective, a, ionic bond as strong electrostatic attraction between oppositely charged ions b. Covalent bond as strong electrostatic attraction between shared electrons and two nuclei. C. Metallic bond as strong electrostatic attraction between cloud/sea of delocalized electrons and positively charged cations).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-35	Explain the properties of compounds in terms of bonding and structure.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-36	Compare uses and properties of materials such as strength and conductivity as determined by the type of chemical bond present between their atoms.	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-37	Interpret the strength of forces of attraction and their impact on melting and boiling points of ionic and covalent compounds.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-38	Justify the availability of free charged particles (electrons or ions) for conduction of electricity in ionic compounds (solid in molten) covalent compounds and metallic bonds.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-39	Recognize that some substances can ionize when dissolved in water.(e.g. acids dissolves in water and conduct electricity).	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-40	Justify the suitability of usage of graphite, diamond and metals for industrial purposes. Some examples may include : a.graphite as lubricant or an electrode. b. Diamond in cutting tools. c. Metals for wires, and sheets).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-41	Draw the structure of ionic and covalent compounds along with their formation. (some examples can include: a. ionic bonds in binary compounds such as NaBr, NaF, CaCl ₂ using dot-and cross diagrams and Lewis dot structures b. simple molecules including H ₂ , Cl ₂ , O ₂ , N ₂ , H ₂ O, CH ₄ , NH ₃ , HCl, CH ₃ OH, C ₂ H ₄ , CO ₂ , HCN, and similar molecules using dot-and- cross diagrams and Lewis dot structures).	Application	Summative	Question(s) will be asked in annual examination.	
	Stoichiometry	SLO: C-09-B-42	State the formulae of common elements and compounds.	Knowledge	Summative	Question(s) will be asked in annual examination.	12
		SLO: C-09-B-43	Define molecular formula of a compound as the number and type of different atoms in one molecule.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-44	Define empirical formula of a compound as the simplest whole number ratio of different atoms in a molecule.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-45	Deduce the formula and name of a binary ionic compounds from ions given relevant information.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-46	Deduce the formula of a molecular substance from the given structure of molecules.	Application	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-47	Use the relationship. Amount of substance = mass / molar mass to calculate number of moles, mass, molar mass, relative mass (atomic/molecular/formula) and number of particles.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-48	Define mole as amount of substance containing Avogadro's number (6.02×10^{23}) of particles.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-49	Explain the relationship between a mole and Avogadro's constant.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-50	Construct chemical equations and ionic equations to show reactants forming products, including state symbols.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-51	Deduce the symbol equation with state symbols for a chemical reaction given relevant information.	Application	Summative	Question(s) will be asked in annual examination.	
	Electrochemistry	SLO: C-09-B-52	Define redox reactions as simultaneous oxidation and reduction in terms of oxygen, hydrogen, electrons and changes in oxidation state.	Knowledge	Summative	Question(s) will be asked in annual examination.	12
		SLO: C-09-B-53	Use roman numerals to indicate oxidation number of an element in a compound.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-54	Identify oxidizing and reducing agents in a redox reaction.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-55	Recognize that the oxidation number of elements in their free state is zero.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-56	Derive the formula of ionic compounds from ionic charges and oxidation numbers.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-57	Identify that the oxidation number of monatomic ion is the same as the charge on the ion.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-58	Explain that the sum of the oxidation numbers in a neutral compound is zero.	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-59	Explain that the sum of the oxidation numbers in an ion is equal to the charge on the ion.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-60	Identify redox reactions by the colour changes involved when using acidified aqueous potassium manganate (VII) to (II) or aqueous potassium iodide.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-61	Define corrosion and discuss methods to prevent it. (Some examples may include barrier method such as using paint galvanizing, electroplating; sacrificial protection such as using magnesium blocks in ships).	Understanding	Summative	Question(s) will be asked in annual examination.	
	Energetics	SLO: C-09-B-62	Explain the idea of a chemical system and its connection with its surroundings influences energy transfer during a chemical reaction.	Knowledge	Summative	Question(s) will be asked in annual examination.	07
		SLO: C-09-B-63	Differentiate between exothermic and endothermic reactions by giving examples.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-64	State that thermal energy is called enthalpy change and recognize its sign as negative for exothermic and positive for endothermic reactions.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-65	Define activation energy as the minimum energy that colliding particles must have for a successful collision.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-66	Explain that activation energy depends on reaction pathway which can be changed using catalysts or enzyme (detailed pathways not required).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-67	Draw, label and interpret reaction pathway diagram for exothermic and endothermic reaction which includes enthalpy change, activation energy (un-catalyzed and catalyzed), reactants and products.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-68	Recognize that bond breaking is endothermic and bond making is exothermic processes.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-69	Explain that enthalpy change is sum of energies absorbed and released in bond breaking and bond forming.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-70	Calculate enthalpy change of a reaction given bond energy values.	Application	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-71	Explain how respiration (aerobic and anaerobic), an exothermic process, provides energy for biological systems and lipids as reserve stores of energy.	Understanding	Summative	Question(s) will be asked in annual examination.	
	Chemical Equilibrium	SLO: C-09-B-72	Recognize that reversible reaction are shown by symbol ($\rightleftharpoons$) and may not go to completion.	Understanding	Summative	Question(s) will be asked in annual examination.	05
		SLO: C-09-B-73	Describe how changing the physical conditions of a chemical equilibrium system can redirect reversible reactions. a. effect of heat on hydrated compounds b. addition of water to anhydrous substances in particular copper(II) sulfate and cobalt (II) chloride	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-74	State that reversible reaction can achieve equilibrium in a closed system when rate of forward and backward reactions are equal.	Knowledge	Summative	Question(s) will be asked in annual examination.	
	Acids, Bases Chemistry and pH	SLO: C-09-B-75	Define Bronsted-Lowry acids as proton donors and Bronsted-Lowry bases as proton acceptors.	Knowledge	Summative	Question(s) will be asked in annual examination.	09
		SLO: C-09-B-76	Recognize that aqueous solutions of acids contain H^+ ions and aqueous solutions of alkalis contain OH^- ions.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-77	Define a strong acid and bases as an acid or base that completely dissociates in aqueous solution and weak acid and base that partially dissociates in aqueous solution. (Some examples include: Student writing symbol equations to show these for hydrochloric acid, sulphuric acid, nitric acid, and ethanoic acid.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-78	Formulate dissociation equations for an acid or base in aqueous solution.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-79	Recognize that bases are oxides or hydroxides of metals and that alkalis are water-soluble bases.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-80	Describe the characteristic properties of acids in terms of their reactions with metals, bases and carbonates.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-81	Identify the characteristic properties of bases in terms of their reactions with acids and ammonium salts.	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-B-82	Define acid rain.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-B-83	Discuss effects of acid rain and relate them with properties of acids.	Application	Summative	Question(s) will be asked in annual examination.	
C	Periodic Table & Periodicity	SLO: C-09-C-01	Define the periodic table as an arrangement of elements in periods and groups in order of increasing proton number / atomic number.	Knowledge	Summative	Question(s) will be asked in annual examination.	20
		SLO: C-09-C-02	Identify the group or period or block of an element using its electronic configuration (only the idea of subshells related to the blocks can be introduced).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-03	Explain the relationship between group number and the charge of ions formed from elements in the group in terms of their outermost shells.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-04	Explain similarities in the chemical properties of elements in the same group in terms of their electronic configuration.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-05	Identify trends in group and periods, given information about the elements, including trends for atomic radius, electron affinity, electronegativity, ionization energy, metallic character, reactivity and density.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-06	Use terms alkali metals, alkaline earth metals, halogens, noble gases, transition metals, lanthanides and actinides in reference to the periodic table.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-07	Predict the characteristic properties of an element in a given group by using knowledge of chemical periodicity.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-08	Deduce the nature, possible position in the Periodic Table and the identity of unknown elements from given information about their physical and chemical properties.	Application	Summative	Question(s) will be asked in annual examination.	
	Group Properties and Elements	SLO: C-09-C-09	Group I Properties Define Group 1, Alkali metals as relatively soft metals with general trends down the group limited to decreasing melting point, increasing density and increasing reactivity.	Knowledge	Summative	Question(s) will be asked in annual examination.	10
		SLO: C-09-C-10	Predict properties of other elements in group I, given information about the elements.	Application	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-C-11	Predict properties of elements in group I in order of reactivity given relevant information.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-12	Group VII Properties Define Group-VII, halogens as diatomic non-metals with general trends limited to increasing density, and decreasing reactivity.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-13	Identify the appearance of halogens as fluorine as pale yellow gas, chlorine as yellow-green gas, bromine as red-brown liquid, iodine as grey black solid.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-14	Explain the displacement reactions of halogens with other halide ions and also as reducing agents.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-15	Predict the properties of elements in group VII, given information about the elements.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-16	Analyze the relative thermal stabilities of the hydrogen halides and explain these in terms of bond strengths.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-17	Transition elements Describe Transition elements as metals that: have high densities, high melting points, variable oxidation numbers, form colored compounds and act as catalysts for industrial purposes. (some examples include catalysts being used are the Haber process, catalytic converters, Contact process and manufacturing of margarine).	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-18	Noble gases Define the Group 18 noble gases as unreactive, monatomic gases.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-19	Explain this (Nobel gases) in terms of electronic configuration.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-C-20	Properties of metals Compare the general physical properties of metals and non-metals. (Specifically in terms of, a. thermal conductivity, b. electrical conductivity, c. malleability and ductility. d. melting points and boiling points)	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
D	Atmosphere	SLO:C-09-D-01	State that composition of clean, dry air is approximately 78% Nitrogen N ₂ , 21% Oxygen O ₂ , and the remainder as a mixture of noble gases and carbon dioxide CO ₂ .	Knowledge	Summative	Question(s) will be asked in annual examination.	07
		SLO:C-09-D-02	State the major sources of air pollutants. (Some examples include: a. Carbon dioxide from the complete combustion of carbon-containing fuels, b. Carbon monoxide and particulates from the incomplete combustion of carbon-containing fuels, c. methane from the decomposition of vegetation and waste gasses from digestion in animals. d. Oxides of nitrogen from car engines, e. Sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds f. Ground level ozone from reactions of oxides of nitrogen, from car engines, and volatile organic compounds, in presence of light).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-03	State the adverse effects of air pollutants (Some examples include: a. carbon dioxide: higher levels of carbon dioxide leading to increased global warming, which leads to climate change b. carbon monoxide: toxic gas c. particulates: increased risk of respiratory problems and cancer d. methane: higher levels of methane leading to increased global warming, which leads to climate change e. oxides of nitrogen: acid rain, photochemical smog and respiratory problems, f. sulfur dioxide: acid rain and haze).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-04	Explain how the greenhouse gasses carbon dioxide and methane cause global warming? (Some examples include : a. The absorption, reflection and emission of thermal energy, b. Reducing thermal energy loss to space).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-05	Describe the role of sulfur in the formation of acid rain and its impact on the environment.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-06	Describe the strategies to reduce the effects of major environmental issues. (Some examples include: a. climate change: planting trees, reduction in livestock farming, decreasing use of fossil fuels, increasing use of hydrogen and renewable energy, e.g. wind, solar. b. acid rain: use of catalytic converters in vehicles, reducing emissions of sulfur dioxide by using low sulfur fuels and flue gas desulfurization with calcium oxide).	Application	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-07	Describe the role of NO and NO ₂ in the formation of acid rain, both directly and through their catalytic role in the oxidation of atmospheric sulfur dioxide.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-08	Explain how oxides of nitrogen form in car engines and describe their removal by catalytic converters, e.g. $\text{CO} + 2\text{NO} \longrightarrow 2\text{CO} + \text{N}_2$	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO:C-09-D-09	Define photosynthesis as the reaction between carbon dioxide and water to produce glucose and oxygen in the presence of chlorophyll and using, energy from light.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-10	Analyze how to use tools to reduce personal exposure to harmful pollutants. (Some examples include the usage of masks, air quality indices and CO detectors).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO:C-09-D-11	Identify high risk situations in life including those where long-term exposure to these pollutants can lead to respiratory issues and reduction in quality and longevity of life.	Understanding	Summative	Question(s) will be asked in annual examination.	
	Environmental Chemistry-Water	SLO: C-09-D-12	Investigate chemical tests for the presence of water using anhydrous copper (II) sulfate.	Understanding	Summative for PBA (Practical Based Assessment)	Lab work-Question(s) will be asked in PBA	06
		SLO: C-09-D-13	Explain how to test the purity of water using melting point and boiling point.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA	
		SLO: C-09-D-14	Distinguish between Distilled water and tap water with their applications in practical chemistry.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA	
		SLO: C-09-D-15	State that water from natural sources may contain useful and harmful substances. (Some examples include: a. dissolved oxygen b. metal compounds. c. plastics d. sewage. e. harmful microbes. f. nitrates from fertilizers. g. phosphates from fertilizers and detergents)	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-16	Recognize that some naturally occurring substances in water are beneficial. (Some examples include, : a. Dissolved oxygen for aquatic life. b. Some metal compounds provide essential minerals for life.)	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-17	Recognize that some naturally occurring substances in water are potentially harmful. (Some examples include: a. some metal compounds that are toxic, b. some plastics that harm aquatic life. c. sewage that contains harmful microbes which cause diseases. d. nitrates and phosphates that lead to deoxygenation of water and damage to aquatic life. Details of the eutrophication process are not required).	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-18	Explain the treatment of the domestic water supply. (Some examples of this includes. a. Sedimentation and filtration to remove solids. b. Use of carbon to remove tastes and odors. c. chlorination to kill microbes).	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-D-19	Describe various water-borne diseases and the steps that can be taken to avoid them.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-20	Identify the negative effects of water pollutants on life and the ways to avoid them.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-21	Explain water scarcity as an important issue faced by Pakistan and the ways in which it can be resolved.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-22	Fertilizers State that urea, ammonium salts and nitrates are used as fertilizers.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-D-23	Explain the use of NPK fertilizers to provide the elements nitrogen, phosphorus and potassium for improved plant growth.	Understanding	Summative	Question(s) will be asked in annual examination.	
E	Organic Chemistry	SLO: C-09-E-01	Describe organic molecules as either straight-chained, branched or cyclic.	Understanding	Summative	Question(s) will be asked in annual examination.	12
		SLO: C-09-E-02	State that a structural formula is an unambiguous description of the way the atoms in a molecule are arranged, including $\text{CH}_2=\text{CH}_2$, $\text{CH}_3\text{CH}_2\text{OH}$, $\text{CH}_3\text{COOCH}_3$.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-03	Identify and draw structural formulae for molecules.	Application	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-04	Interpret general formulae of compounds in the same homologous series including alkanes, alkenes, alkynes, alcohols and carboxylic acids.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-05	Define structural isomers as compounds with the same molecular formula, but different structural formulae, including C_4H_{10} as $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_3$; and C_4H_8 as $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ and $\text{CH}_3\text{CH}=\text{CHCH}_3$	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-06	Identify a functional group as an atom or group of atoms that determine the chemical properties of a homologous series, including alcohols, aldehydes, ketones, phenols, carboxylic acids, amine, esters, and amide.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-07	Describe the general characteristics of a homologous series (These can include: a Having the same functional group. b . Having the same general formula.	Understanding	Summative	Question(s) will be asked in annual examination.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
			c. Differing from one member to the next by a—CH ₂ — unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties).				
		SLO: C-09-E-08	State that a saturated compound has molecules in which all carbon-carbon bonds are single bonds.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-09	State that an unsaturated compound has molecules in which one or more carbon—carbon bonds are not single bonds.	Knowledge	Summative	Question(s) will be asked in annual examination.	
	Hydrocarbons	SLO: C-09-E-10	State that the bonding in alkanes is single covalent and that alkanes are saturated hydrocarbons.	Knowledge	Summative	Question(s) will be asked in annual examination.	07
		SLO: C-09-E-11	Describe the properties of alkanes as being generally unreactive, except in terms of combustion and substitution by chlorine.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-12	State that in a substitution reaction one atom or group of atoms is replaced by another atom or group of atoms.	Knowledge	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-13	Describe the substitution reaction of alkanes with chlorine as a photochemical reaction, and draw the structural or displayed formulae of the products, limited to monosubstitution.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-14	Describe, using symbol equations, preparation of alkanes from cracking of larger hydrocarbons, hydrogenation of alkenes and alkynes, and reduction of alkyl halides.	Understanding	Summative	Question(s) will be asked in annual examination.	
	Biochemistry	SLO: C-09-E-15	Explain the importance and basics of nutrition and healthy eating.	Understanding	Summative	Question(s) will be asked in annual examination.	05
		SLO: C-09-E-16	Recognize the main biomolecules; carbohydrates, proteins, lipids and nucleic acids, their sources, along with the required daily intake for young adults.	Understanding	Summative	Question(s) will be asked in annual examination.	
		SLO: C-09-E-17	Identify carbohydrates as a source of energy.	Understanding	Summative	Question(s) will be asked in annual examination.	
F	Scientific Notation/ Standard Form	SLO: C-09-F-01	Explain that units are standardized for better communication and collaboration. (Some examples may include: In the field of chemistry, the International System of Units (SI) is used to measure physical quantities such as mass, volume, and temperature. This	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a	02

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
			standardized system ensures that chemists worldwide can use the same units to measure and communicate their results, facilitating communication and collaboration in the field. -Without standardized units, it would be difficult for chemists to compare their results with one another, and it would be challenging to develop consistent and accurate scientific models. For example, imagine if one chemist measured the mass of a substance in grams, while another used ounces. The two measurements would be difficult to compare and combine, potentially leading to inaccurate or inconsistent results.)			part of classroom teaching.	
		SLO: C-09-F-02	Identify SI units for abstract and physical quantities. (Some examples include mass, time and amount of matter.)	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-F-03	Apply the concept that units can be combined with terms for magnitude, especially kilo, deci, and milli.	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-F-04	Justify why chemists use cm³ , g and s as more practical units when working with small amounts in lab.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-05	Explain with examples how different tools and techniques can be used to manage accuracy and precision for inherent errors that arise during measurement.	Knowledge	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-F-06	Use the standard form $A \times 10^n$ where n is a positive or negative integer, and $1 \leq A < 10$.	Understanding	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-F-07	Convert quantitative values into and out of the scientific notation form.	Application	Formative	Question(s) will not be asked in annual examination,	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
						however it will be a part of classroom teaching.	
		SLO: C-09-F-08	Calculate with values in standard form.	Application	Formative	Question(s) will not be asked in annual examination, however it will be a part of classroom teaching.	
		SLO: C-09-F-09	Identify appropriate apparatus for the measurement of time, temperature, mass and volume, including: a. stop watches. b. thermometers. c. balances, d. burettes, e. volumetric pipettes, f. measuring cylinders. g. gas syringes.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-10	Suggest advantages and disadvantages of experimental methods and apparatus.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
	Separation Techniques	SLO: C-09-F-11	Define important terms associated with creating chemical solutions.(Some examples include: a. Solvent as a substance that dissolves a solute. b. Solute as a substance that is dissolved in a solvent. c. Solution as a mixture of one or more solutes dissolved in a solvent. d. Saturated solution as a solution containing the maximum concentration of a solute dissolved in the solvent at a specified temperature. e. Residue as a substance that remains after evaporation, distillation, filtration or any similar process. f. Filtrate as a liquid or solution that has passed through a filter).	Knowledge	Summative for PBA	Lab work-Question(s) will be asked in PBA.	08
		SLO: C-09-F-12	Explain methods of separation and purification (some example include: a. Using a suitable solvent. b. Filtration. c. Crystallization. d. simple distillation & fractional distillation).	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-13	Suggest suitable separation and purification techniques, given information about the substances involved, and their usage in daily life.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-14	Identify substances and assess their purity using melting point and boiling point information.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
	Qualitative Analysis	SLO: C-09-F-15	Describe tests to identify important gasses (Some examples include a. Ammonia, NH ₃ , using damp red litmus paper. b. Carbon dioxide, CO ₂ , using limewater.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	04

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
			c. Chlorine, Cl ₂ , using damp litmus paper. d. Hydrogen, H ₂ , using a lighter, splint. e. Oxygen, O ₂ , using a glowing splint. f. Sulfur dioxide, SO ₂ , using acidified aqueous potassium manganate (VII).				
		SLO: C-09-F-16	Explain the use of a flame test to identify important cations:(Some examples include: a) lithium, Li ⁺ b) sodium, Na ⁺ c) potassium, K ⁺ d) calcium, Ca ²⁺ e) copper (II), Cu ²⁺ f) barium, Ba ²⁺	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
	Chromatography	SLO: C-09-F-17	Describe how paper chromatography is used to separate mixtures of soluble substances, using a suitable solvent.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	06
		SLO: C-09-F-18	Describe the use of locating agents when separating mixtures in Chromatography containing colorless substances.(For context, knowledge of specific locating agents is not required)	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-19	Interpret simple chromatograms (For context, students should identify: a) unknown substances by comparison with known substances, b) pure and impure substances)	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-F-20	State and use the equation for R _f .	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
G	Lab and Practical Skills	SLO: C-09-10-G-01	Explain, with examples, the types of chemical hazards in the lab and suggest safety precautions. (Types of chemical hazards to be identified: flammable or explosive hazards, corrosive hazards, toxic hazards, reactive hazards, radiation hazards and asphyxiation hazards).	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	10
		SLO: C-09-10-G-02	Recognize the meaning of different chemical hazard signs in the lab and on chemicals.	Knowledge	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work	
		SLO: C-09-10-G-03	Recognize the importance of personal protective equipment (PPE) by correctly lab activities identifying the types of PPE needed for different lab activities.	Knowledge	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work	
		SLO: C-09-10-G-04	Locate the nearest fire extinguisher and emergency shower.	Understanding	Formative	Question(s) will not	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
					for PBA	be asked in annual examination, however it will be a part of Lab work	
		SLO: C-09-10-G-05	Show awareness of emergency procedures in the event of an emergency in the lab.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-06	Identify apparatus from diagrams or descriptions.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-07	Draw, complete or label diagrams of apparatus.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-08	Explain the use of, common techniques, apparatus and materials.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-09	Select the most appropriate apparatus or method for the task and justify the choice made	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-10	Describe tests (qualitative, gas tests, other tests).	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-11	Describe and explain techniques used to ensure the accuracy of observations and data.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-12	Carry out the following tests under supervision. • Identification of metal ions. • Non-metal ions and gases. • Chemical test for water. • Test-tube reactions of dilute acids, including ethanoic acid. • Tests for oxidizing and reducing agents. • Melting points and boiling points. • Displacement reactions of metals and halogens. • Temperature changes during reactions.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-13	Carry out separation and purification techniques. (This may include: • Filtration. • Crystallization.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
			- Simple distillation, fractional distillation. - Chromatography. - Electrolysis).				
		SLO: C-09-10-G-14	Suggest the most appropriate apparatus or technique and justify the choice made.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-15	Describe experimental procedures.	Understanding	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-16	Take readings from apparatus (analogue and digital) or from diagrams of apparatus with appropriate precision.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-17	Take sufficient observations or measurements, including repeats where appropriate.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-18	Record qualitative observations from chemical tests and other tests.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-19	Record observations and measurements systematically (in a suitable table, to an appropriate degree of precision and using appropriate units).	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-20	Record the results of an experiment.	Application	Summative for PBA	Lab work-Question(s) will be asked in PBA.	
		SLO: C-09-10-G-21	Process the results of an experiment to form a conclusion or to evaluate a prediction.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-22	Predict expected results.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-23	Interpret and evaluate experimental observations and data.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-24	Process data, including for use in further calculations or for graph plotting.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
		SLO: C-09-10-G-25	Present data graphically, including the use of best-fit lines where appropriate.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-26	Analyze and interpret observations and data, including data presented graphically.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-27	Form conclusions justified by reference to observations and data and with appropriate explanation.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-28	Evaluate the quality of observations and data, identifying any anomalous results.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-29	Identify potential sources of error in an experimental design.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-30	Assess the limitations of an experimental design.	Understanding	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-31	Evaluate experimental arrangements, methods and techniques, including the control of variables.	Application	Formative for PBA	Question(s) will not be asked in annual examination, however it will be a part of Lab work.	
		SLO: C-09-10-G-32	Suggest possible improvements to the apparatus, experimental arrangements, methods or techniques.	Understanding	Formative for PBA	Question(s) will not be asked in annual	

Domains	Content Area	SLO No.	SLO Description	Cognitive Level	Type of Assessment	Remarks	Time allocation (Periods 1Period =40 minutes)
						examination, however it will be a part of Lab work.	
							Total periods =175

Note: PBA STANDS FOR PRACTICAL BASED ASSESSMENT

FINAL CONCEPTUAL PATTERN OF SSC-I & II

Physics, Chemistry, Biology and Computer Science

Total Marks: 60 Marks (Theory Paper)

Components	Detail
Marks Allocated to MCQs	30 marks
Total MCQs	60
Marks per MCQ	0.5
Objective Portion – MCQs (30 Marks)	(Time Allowed: 1:20 hours) Section-A 40 straight MCQs ($40 \times 0.5 = 20 \text{ marks}$) 20 MCQs with (stimulus/situations/scenario) ($20 \times 0.5 = 10 \text{ marks}$)
Subjective Portion – SRQs & ERQs (30 Marks)	(Time Allowed: 1:40 hours) Section- B Section B having 6 questions. Each question has internal choice. Each question having 3 marks. ($3 \times 6 = 18 \text{ marks}$) Section -C Section C having 2 questions. Each question has internal choice. Each question having 6 marks. ($2 \times 6 = 12 \text{ marks}$)
Subjective Portion Structure	6 straight SRQs (with no sub parts) 2 straight ERQs (may have part but with same concept)

Important Note:

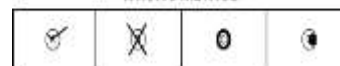
- i) Summative SLOs of NCP Chemistry 2022-23 for grades IX or X will only be included.
- ii) Ensure balanced domain coverage using the Table of Specifications (ToS).

PHY/CHEM/BIO/COMP SSC-I

CORRECTLY FILLED



WRONG METHOD



To be filled-in by the Candidate

PAPER VERSION	(A)	(B)	(C)	(D)	(E)
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Time Allowed: 1:20 Hours

Total Marks: 30

Candidate Sign. _____

Invigilator Sign. _____

Question Booklet No. _____

Roll No. _____

FILL ONLY ONE BUBBLE FOR EACH CORRECT ANSWER. USE BLACK BALL POINT/MARKER

1	(A)	(B)	(C)	(D)	16	(A)	(B)	(C)	(D)	31	(A)	(B)	(C)	(D)	46	(A)	(B)	(C)	(D)
2	(A)	(B)	(C)	(D)	17	(A)	(B)	(C)	(D)	32	(A)	(B)	(C)	(D)	47	(A)	(B)	(C)	(D)
3	(A)	(B)	(C)	(D)	18	(A)	(B)	(C)	(D)	33	(A)	(B)	(C)	(D)	48	(A)	(B)	(C)	(D)
4	(A)	(B)	(C)	(D)	19	(A)	(B)	(C)	(D)	34	(A)	(B)	(C)	(D)	49	(A)	(B)	(C)	(D)
5	(A)	(B)	(C)	(D)	20	(A)	(B)	(C)	(D)	35	(A)	(B)	(C)	(D)	50	(A)	(B)	(C)	(D)
6	(A)	(B)	(C)	(D)	21	(A)	(B)	(C)	(D)	36	(A)	(B)	(C)	(D)	51	(A)	(B)	(C)	(D)
7	(A)	(B)	(C)	(D)	22	(A)	(B)	(C)	(D)	37	(A)	(B)	(C)	(D)	52	(A)	(B)	(C)	(D)
8	(A)	(B)	(C)	(D)	23	(A)	(B)	(C)	(D)	38	(A)	(B)	(C)	(D)	53	(A)	(B)	(C)	(D)
9	(A)	(B)	(C)	(D)	24	(A)	(B)	(C)	(D)	39	(A)	(B)	(C)	(D)	54	(A)	(B)	(C)	(D)
10	(A)	(B)	(C)	(D)	25	(A)	(B)	(C)	(D)	40	(A)	(B)	(C)	(D)	55	(A)	(B)	(C)	(D)
11	(A)	(B)	(C)	(D)	26	(A)	(B)	(C)	(D)	41	(A)	(B)	(C)	(D)	56	(A)	(B)	(C)	(D)
12	(A)	(B)	(C)	(D)	27	(A)	(B)	(C)	(D)	42	(A)	(B)	(C)	(D)	57	(A)	(B)	(C)	(D)
13	(A)	(B)	(C)	(D)	28	(A)	(B)	(C)	(D)	43	(A)	(B)	(C)	(D)	58	(A)	(B)	(C)	(D)
14	(A)	(B)	(C)	(D)	29	(A)	(B)	(C)	(D)	44	(A)	(B)	(C)	(D)	59	(A)	(B)	(C)	(D)
15	(A)	(B)	(C)	(D)	30	(A)	(B)	(C)	(D)	45	(A)	(B)	(C)	(D)	60	(A)	(B)	(C)	(D)



Federal Board SSC-I Examination

Chemistry Model Question Paper

National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)
(50% MCQs & 50% Descriptive)

SECTION - A (Marks 30)

Time Allowed: 1:20 hours

Section – A is compulsory. All parts of this section are to be answered on the OMR Sheet given in the E-Sheet and handed over to the Centre Superintendent. Deleting/ overwriting is not allowed. Do not use lead pencil.

Roll Number							Paper Version
							A

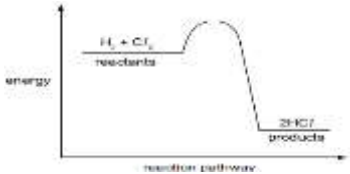
Candidate Sign. _____

Invigilator Sign. _____

Note: Fill the correct bubble for each question on OMR Sheet given in the E-Sheet. Each question carries 0.5 mark.

Q #	Question	A	B	C	D
1.	Diamond is used in cutting tools. The reason for this use is:	It has a layered structure with weak van der Waals forces	It is a highly dense form of pure carbon	It has a strong three-dimensional network structure	It contains delocalized free electrons
2.	Which of the following is a compound?	Air	Iron	Carbon dioxide	Brass
3.	Which of the following combinations is correctly matched?	Sugar + Water → Suspension	Milk → Colloid	Sand + Water → Solution	Air → Suspension
4.	The shells around the nucleus are also called:	Orbitals	Energy levels	Nuclei	
5.	Identify no of electron, protons and neutrons in an element ${}^{26}_{58}\text{X}$	25,26,31	26, 26, 26	26, 26, 33	26,26,32
6.	An element contains two isotopes, mass=24, abundance (90%) and mass 25, abundance (10%). The relative atomic mass of the element is.	24.1	24.5	24.9	25.0
7.	What is the formula of aluminium oxide formed from Al^{3+} and O^{2-} ?	AlO	Al_2O_3	Al_3O_2	AlO_3

8.	Which change is an example of oxidation?	chloride ions to chlorine atoms	copper(II) ions to copper atoms	iron(III) ions to iron(II) ions	oxygen atoms to oxide ions										
9.	In which change is the nitrogen reduced?	NH_3 to NO	NH_3 to NO_3^-	N_2 to NH_3	N^{3-} to N 2										
10.	X and Y are diatomic elements. X is less reactive than Y. What are elements X and Y?	Chlorine and iodine	Fluorine and nitrogen	iodine and bromine	oxygen and nitrogen										
11.	Which pair of properties are both correct for a typical transition element?	Forms coloured compounds and soluble in water	High density and has variable oxidation states	Low density and high melting point	Low melting point and can act as a catalyst										
12.	Which two compounds are members of the same homologous series? 1 $\begin{array}{c} H \\ \\ H-C-O-H \\ \\ H \end{array}$ 2 $\begin{array}{c} H \\ \\ H-C-C(=O)-O-H \\ \quad \\ H \quad O \end{array}$ 3 $\begin{array}{c} H \quad H \\ \quad \\ H-C-C-O-H \\ \quad \\ H \quad H \end{array}$ 4 $\begin{array}{c} H \quad H \\ \quad \\ H-C-O-C-H \\ \quad \\ H \quad H \end{array}$	1 and 2	1 and 3	1 and 4	2 and 4										
13.	Which structure is not an isomer of the structure shown? $CH_3-CH_2-CH_2-CH_2-CH_3$	A $CH_3-CH_2-\underset{\begin{array}{c} \\ CH_3 \end{array}}{CH}-CH_3$	B $\begin{array}{c} CH_3 \\ \\ CH_3-C-CH_3 \\ \\ CH_3 \end{array}$	C $CH_3-CH_2-CH_2-\underset{\begin{array}{c} \\ CH_3 \end{array}}{CH_2}$	D $\begin{array}{c} CH_3-CH-CH_2-CH_3 \\ \\ CH_3 \end{array}$										
14.	Which two elements react together to form an ionic compound? <table><tr><td>element</td><td>Electronic configuration</td></tr><tr><td>W</td><td>2,4</td></tr><tr><td>X</td><td>2,8</td></tr><tr><td>Y</td><td>2,8,1</td></tr><tr><td>Z</td><td>2,8,7</td></tr></table>	element	Electronic configuration	W	2,4	X	2,8	Y	2,8,1	Z	2,8,7	W and X	X and Y	Y and Z	Z and W
element	Electronic configuration														
W	2,4														
X	2,8														
Y	2,8,1														
Z	2,8,7														

15.	The symbols of two atoms may be written as shown. ${}^{52}_{23}\text{X} \quad {}^{52}_{24}\text{Y}$ Which statement about these atoms is correct?	They are different elements because they have different numbers of neutrons.	They are different elements because they have different numbers of protons.	They are isotopes of the same element because they have the same nucleon number.	They are isotopes of the same element because they have the same proton number
16.	The atoms ${}^{64}_{29}\text{Cu}$ and ${}^{65}_{30}\text{Zn}$ have the same	nucleon number	number of electrons	number of neutrons	proton number
17.	Why does molten sodium chloride conduct electricity?	It has free mobile electrons	The ions move freely when bonds break	Heating makes electrons mobile	Sodium becomes a conductive metal
18.	Which of the following changes is endothermic?	$\text{H}_{(\text{g})} + \text{Cl}_{(\text{g})} \rightarrow \text{HCl}_{(\text{g})}$	$\text{H}_2\text{O}_{(\text{g})} \rightarrow 2\text{H}_{(\text{g})} + \text{O}_{(\text{g})}$	$\text{H}_2\text{O}_{(\text{l})} \rightarrow \text{H}_2\text{O}_{(\text{s})}$	$2\text{H} + \text{O} \rightarrow \text{H}_2\text{O}_{(\text{l})}$
19.	The reaction $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$ is exothermic because	more bonds are broken than are formed	more bonds are formed than are broken	the energy needed to break the bonds is greater than that released on forming new bonds	the energy needed to break the bonds is less than that released on forming new bonds
20.	The energy profile diagram for the reaction between hydrogen and chlorine is shown.  What information about the type of reaction and the sign of enthalpy change (ΔH) does the diagram show?	endothermic and negative ΔH	endothermic and positive ΔH	exothermic and negative ΔH	exothermic and positive ΔH
21.	The equation represents the action of dilute nitric acid on copper. $x\text{Cu} + y\text{HNO}_3 \rightarrow x\text{Cu}(\text{NO}_3)_2 + 4\text{H}_2\text{O} + 2\text{NO}$ What are the values of x and y?	$x = 1, y = 4$	$x = 1, y = 8$	$x = 3, y = 4$	$x = 3, y = 8$
22.	What is the empirical formula of the compound whose molecular formula is P_4O_{10}?	PO	PO_2	P_2O_5	P_8O_{20}

23.	What is the mass in grams of 3.0×10^{23} molecules of CO_2 ?	22 g	44 g	66 g	88 g
24.	Hydrogen and chlorine react as shown. 1 molecule of hydrogen + 1 molecule of chlorine $\rightarrow$ 2 molecule of hydrogen chloride What is the equation for this reaction?	$2\text{H} + 2\text{Cl} \rightarrow 2\text{HCl}$	$2\text{H} + 2\text{Cl} \rightarrow \text{H}_2\text{Cl}_2$	$\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$	$\text{H}_2 + \text{Cl}_2 \rightarrow \text{H}_2\text{Cl}_2$
25.	What is the total number of atoms contained in 2.00 moles of nickel?	3×10^{24}	2.4×10^{24}	6.02×10^{23}	1.2×10^{24}
26.	Alkanes are a homologous series of organic compounds. Which statement about alkanes is correct?	Their boiling points increase as the length of the carbon chain increases	Their general formula is C_nH_{2n}	They are unsaturated hydrocarbons	They take part in addition reactions
27.	Which of the following groups contain compounds that all belong to the same homologous series?	CH_4 C_2H_6 C_3H_6	CH_4 C_2H_6 C_3H_8	C_2H_4 C_3H_6 C_4H_{10}	C_3H_4 C_3H_6 C_3H_8
28.	Butane and methylpropane are isomers. Which formula is different for the two isomers?	empirical formula	general formula	molecular formula	structural formula
29.	Which gas cannot be removed from the exhaust gases of a petrol-powered car by its catalytic converter?	carbon dioxide	carbon monoxide	hydrocarbons	nitrogen dioxide
30.	Which noble gas is present in the largest percentage by volume in air?	argon	helium	krypton	neon
31.	Ammonia gas is produced when solid ammonium chloride is heated with	calcium hydroxide	calcium sulphate	hydrochloric acid	magnesium nitrate
32.	The following equations represent reactions of dilute sulphuric acid. Which reaction is not 'typical' of a dilute acid?	$2\text{KOH}_{(aq)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow \text{K}_2\text{SO}_{4(aq)} + 2\text{H}_2\text{O}_{(l)}$	$\text{CuO}_{(s)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow \text{CuSO}_{4(aq)} + \text{H}_2\text{O}_{(l)}$	$\text{Pb}(\text{NO}_3)_{2(aq)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow \text{PbSO}_{4(s)} + 2\text{HNO}_{3(aq)}$	$\text{ZnCO}_{3(s)} + \text{H}_2\text{SO}_{4(aq)} \rightarrow \text{ZnSO}_{4(aq)} + \text{CO}_{2(g)} + \text{H}_2\text{O}_{(l)}$
33.	What is the ionic equation for the reaction between zinc and aqueous copper (II) sulfate?	$\text{Zn}^{2+}_{(aq)} + \text{Cu}_{(s)} \rightarrow \text{Zn}_{(s)} + \text{Cu}^{2+}_{(aq)}$	$\text{Zn}^{2+}_{(aq)} + \text{SO}_4^{2-}_{(aq)} \rightarrow \text{ZnSO}_{4(s)}$	$\text{Zn}_{(s)} + \text{CuSO}_{4(aq)} \rightarrow \text{Cu}_{(s)} + \text{ZnSO}_{4(aq)}$	$\text{Zn}_{(s)} + \text{Cu}^{2+}_{(aq)} \rightarrow \text{Zn}^{2+}_{(aq)} + \text{Cu}_{(s)}$

	$Zn_{(s)} + CuSO_{4(aq)} \rightarrow Cu_{(s)} + ZnSO_{4(aq)}$												
34.	A student studies the reversible dehydration equilibrium of a hydrated salt: $CuSO_4 \cdot 5H_2O_{(s)} \rightleftharpoons CuSO_{4(s)} + 5H_2O_{(g)}$ The blue copper(II) sulfate crystals slowly turn into a white powder when heated. The appearance of the white powder indicates that the equilibrium shifted toward:	The forward reaction, which is endothermic	The forward reaction, which is exothermic	The reverse reaction, which is endothermic	The reverse reaction, which is exothermic								
35.	Which series of changes includes both oxidation and reduction?	$C \rightarrow CO \rightarrow CO_2$	$PbO_2 \rightarrow PbO \rightarrow Pb$	$N_2 \rightarrow NH_3 \rightarrow NO$	$C_2H_2 \rightarrow C_2H_4 \rightarrow C_2H_6$								
36.	A colourless gas is passed into each of three different solutions. The results for each solution are shown in the table. <table><tr><td>Solution</td><td>Result</td></tr><tr><td>Potassium iodide</td><td>Stays Colourless</td></tr><tr><td>Acidified potassium dichromate</td><td>Orange to green</td></tr><tr><td>Acidified potassium permanganate</td><td>Purple to colourless</td></tr></table> What is the colourless gas?	Solution	Result	Potassium iodide	Stays Colourless	Acidified potassium dichromate	Orange to green	Acidified potassium permanganate	Purple to colourless	an acid	an alkali	an oxidising agent	a reducing agent
Solution	Result												
Potassium iodide	Stays Colourless												
Acidified potassium dichromate	Orange to green												
Acidified potassium permanganate	Purple to colourless												
37.	Enzymes help in digestion of food in the human body. Enzymes are:	Carbohydrates	Proteins	Lipids	Minerals								
38.	A student tests a solution with litmus paper and it turns blue. The nature of solution is _____ and having pH value of _____:	Acidic and 5	Basic and 10	Acidic and 10	Basic and 5								
39.	Elements in the same group show similar chemical behavior. This similarity is due to:	Same atomic mass	Same number of shells	Same valence electrons	Same neutrons								
40.	Which of the following elements has the largest atomic size?	Fluorine	Oxygen	Chlorine	Bromine								

	STIMULUS/SITUATION/SCENARIO BASED MCQs					
	Scenario for MCQ (41-44)	A research centre has different laboratories. In one lab, scientists study how enzymes work in the human body. In another lab, researchers develop new medicines to treat diseases. In a third lab, radioactive isotopes are used to treat cancer patients				
41.	Scientists studying how enzymes function in the human body are working in which field?	Organic Chemistry	Biochemistry	Analytical Chemistry	Geochemistry	
42.	The development of new medicines to treat diseases belongs to:	Environmental Chemistry	Organic Chemistry	Polymer Chemistry	Physical Chemistry	
43.	The use of radioactive isotopes in cancer treatment is related to:	Nuclear Chemistry	Inorganic Chemistry	Astrochemistry	Analytical Chemistry	
44.	Which of the following best explains why different laboratories are needed in the research center?	Each laboratory is designed exclusively to handle a specific state of matter (solids, liquids, or gases).	Different branches of chemistry focus on different types of problems and applications	Separate laboratories prevent different chemical elements from contaminating each other's equipment	Laboratories are separated randomly without any purpose	
	Scenario for MCQ (45-48)	Ali melts a piece of wax in a test tube by heating it in a water bath. After removing the heat source, he observes that the liquid wax slowly turns back into a solid.				
45.	What is the name of the process when liquid wax turns into a solid?	Condensation	Evaporation	Freezing	Melting	
46.	Why is this change considered a physical change?	A new substance is formed	The chemical composition changes	The change is reversible and no new substance is formed	Heat is released permanently	
47.	During this change, what happens to the particles of wax?	They break into new atoms	They become chemically different	They come closer together without changing identity	They disappear	
48.	Which property remains unchanged during this process?	State	Shape	Chemical composition	Volume	
	Scenario for MCQ (49-52)	A scientist is analyzing an element X. She finds that its atom has 17 protons, 18 neutrons, and 17 electrons.				
49.	What is the mass number of element X?	13	35	18	17	

50.	Which group and period does element X belong to in the Periodic Table?	Group 1, Period 3	Group 17, Period 3	Group 7, Period 2	Group 17, Period 2	
51.	The electronic configuration of element X is:	2, 8, 7	2, 8, 8	2, 7, 8	2, 7	
52.	What is the atomic number of element X?	18	35	17	19	
	Scenario for MCQ (53-56)	A student studies a group of organic compounds: methane (CH₄), ethane (C₂H₆), propane (C₃H₈), and butane (C₄H₁₀). He observes that each compound differs by one carbon atom and shows similar chemical behavior.				
53.	If the student wants to continue the study with the next compound in this exact same group, what should its chemical formula be?	C ₅ H ₁₀	C ₄ H ₁₂	C ₅ H ₁₂	C ₆ H ₁₄	
54.	What is the common difference between successive members?	CH ₂ group	CH ₃ group	C ₂ H ₄ group	H ₂ group	
55.	Why do these compounds show similar chemical properties?	Same molecular mass	Same functional group	Same number of atoms	Same physical state	
56.	Which property shows a gradual change in a homologous series?	Chemical reactivity	Functional group	Boiling point	Type of bonding	
	Scenario for MCQ (57-60)	In a busy city, heavy traffic releases gases like carbon monoxide (CO), carbon dioxide (CO₂), and nitrogen oxides (NO_x). People living near roads often complain of breathing problems.				
57.	Which gas is most dangerous because it binds with haemoglobin?	CO ₂	CO	NO ₂	SO ₂	
58.	Why is carbon monoxide toxic?	It increases oxygen supply	It forms carboxyhemoglobin reducing oxygen transport	It destroys the red blood cells completely upon contact	It damages the lung tissues	
59.	Which gas contributes most to global warming among these?	CO	CO ₂	NO ₂	SO ₂	
60.	What is the main source of nitrogen oxides in cities?	Burning household garbage in residential areas.	Motor vehicles and the combustion of fossil fuels.	Industrial wastewater treatment plants.	The widespread use of air conditioners and refrigerators	



Federal Board SSC-I Examination

Chemistry Model Question Paper

National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)

(50% MCQs & 50% Descriptive)

Time allowed: 1:40 hours

Total Marks: 30

Note: Answer all parts from Section 'B' and 'C' on the **E-sheet at specifically provided space**. Write your answers on the allotted /given spaces.

SECTION-B [6x3 = 18 Marks]

Q1	A student notices that elements in the Periodic Table follow clear patterns in their size and reactivity instead of changing randomly. Write the names of Group-VII elements. Also, describe the trend in physical state and density of the Group VII elements as you move down the group.	3	OR	State the difference between a compound and a mixture. In your answer, briefly describe the composition of each type of substance.	3
Q2	Compare the variation in reactivity of metals and non-metals using electron behavior.	3	OR	Give in detail the process of electroplating to prevent metals from corrosion	3
Q3	A city shows a sudden rise in respiratory diseases and reduced visibility. Which pollutant is most likely responsible for it, also explain the mechanism by which it affects human health and the environment.	1+2	OR	A young adult plans a balanced diet to maintain good health. Describe three main classes of biomolecules found in food by identifying their common sources along with the recommended daily intake for a young adult.	3
Q4	Describe what happens when HCl reacts with: (a) a sodium metal (b) Na_2CO_3 (c) NaOH	1+1+1	OR	Differentiate between distilled water and tap water and how does the use of carbon improve the quality of drinking water beyond just removing visible impurities?	1+2
Q5	Identify the functional groups in the following compounds: (a) CH_3COOH (b) CH_3CHO (c) $\text{CH}_3\text{CH}_2\text{OH}$	1+1+1	OR	Define a reversible reaction and explain the conditions under which it reaches equilibrium.	1+2
Q6	An element has two atoms: one contains 17 protons and 18 neutrons, while the other contains 17 protons and 20 neutrons. (a) Can these two atoms be considered isotopes of the same element? (b) Predict whether their chemical properties will be similar or different, and justify your answer.	1+2	OR	Define Chemistry. How different states of matter (solids, liquids, gases, and plasma) are involved in chemical interactions.	1+2

SECTION C (2x6=12 Marks)

Q7	An unknown solid substance is analysed, and the following properties are recorded: it is a hard crystalline solid with a very high melting point, does not conduct electricity in solid state, but conducts when melted. Using these observations, explain the type of chemical bonding present in the substance and describe how this bonding is formed. Also, relate its bonding and structure to its high melting point and electrical conductivity behaviour.	1 + 1 + 2 + 2	OR	Ethane is a saturated hydrocarbon obtained during cracking of larger hydrocarbons and can also be formed by hydrogenation of ethene. Explain why ethane is generally unreactive, yet undergoes combustion and substitution with chlorine, and write simple balanced equations for its preparation from hydrogenation of alkynes and alkyl halides.	2+ 2+ 2
Q8	Draw a well-labelled reaction pathway diagram for an exothermic and endothermic reaction, clearly showing reactants, products, activation energy, and enthalpy change with proper labelling. Briefly interpret through energy diagram that how the catalyst affects the energy profile.	2 +2 +2	OR	Calcium ions (Ca^{2+}) combine with chloride ions (Cl^-) to form a compound, and a molecule is shown where one carbon atom is joined with two oxygen atoms. If 11.1 g of the ionic compound and 4.4 g of the molecular substance are given, write the correct formula and name of the ionic compound, find the formula of the molecular substance from its structure, and calculate the number of moles in each sample using the relation $\text{moles} = \text{mass} / \text{molar mass}$.	1+ 1+ 2+ 2

Federal Board SSC-I Examination
Chemistry Model Question Paper
National Curriculum 2022-2023 (Inclusive Scheme of Studies 2024)
(50% MCQs & 50% Descriptive)
Alignment of Questions with Student Learning Outcomes

S.No	SLOs	Marks	Domain	Cognitive level
1.	SLO: C-09-B-04 (Allotropes – diamond): Identify that state is a distinct form of matter (examples could include familiarity with plasma, intermediate states and exotic states e.g. BEC or liquid crystals).	0.5	B	U
2.	SLO: C-09-B-05 (Elements, compounds, mixtures): Explain the allotropic forms of solids (some examples may include diamond, graphite, and fullerenes)	0.5	B	K
3.	SLO: C-09-B-06 (Solutions, colloids, suspensions): Explain the differences between elements, compounds and mixtures.	0.5	B	U
4.	SLO: C-09-B-09 (Energy levels / shells): State that, orbits (shells) are energy levels of electrons and a larger shell implies higher energy and greater average distance from nucleus.	0.5	B	K
5.	SLO: C-09-B-22 (Protons, neutrons, electrons) : Determine the number of protons and neutrons of different isotopes	0.5	B	K
6.	SLO: C-09-B-28 (Relative atomic mass calculation) : Calculate relative atomic mass of an element from relative masses and abundance of isotopes.	0.5	B	A
7.	SLO: C-09-B-45 (Formula from ions): Deduce the formula and name of a binary ionic compounds from ions given relevant information.	0.5	B	K
8.	SLO: C-09-B-52 (Oxidation concept): Define redox reactions as simultaneous oxidation and reduction in terms of oxygen, hydrogen, electrons and changes in oxidation state.	0.5	B	U
9.	SLO: C-09-B-52 (Reduction concept) : Define redox reactions as simultaneous oxidation and reduction in terms of oxygen, hydrogen, electrons and changes in oxidation state.	0.5	B	U
10.	SLO: C-09-C-15 (Halogen reactivity trends) : Define Group-VII, halogens as diatomic non-metals with general trends limited to increasing density, and decreasing reactivity. / Predict the properties of elements in group VII, given information about the elements	0.5	C	A
11.	SLO: C-09-C-17 (Transition elements properties): Describe Transition elements as metals that: have high densities, high melting points, variable oxidation numbers, form colored compounds and act as catalysts for industrial purposes. (some examples include catalysts being used are the Haber process, catalytic converters, Contact process and manufacturing of margarine).	0.5	C	K
12.	SLO: C-09-E-07 (Homologous series): Describe the general characteristics of a homologous series (These can include: a Having the same functional group. b. Having the same general formula. c. Differing from one member to the next by a $\text{—CH}_2\text{—}$ unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties)	0.5	E	U
13.	SLO: C-09-E-05 (Isomerism): Define structural isomers as compounds with the same molecular formula, but different structural formulae, including C_4H_{10} as $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_3$; and C_4H_8 as $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ and $\text{CH}_3\text{CH}=\text{CHCH}_3$	0.5	E	U

14.	SLO: C-09- B-34 (Ionic bonding): Define ionic, covalent, coordinate covalent and metallic bonds. / Differentiate between ionic compounds and covalent compounds.(The following points need to be included in the respective, a, ionic bond as strong electrostatic attraction between oppositely charged ions b. Covalent bond as strong electrostatic attraction between shared electrons and two nuclei. C. Metallic bond as strong electrostatic attraction between cloud/sea of delocalized electrons and positively charged cations).	0.5	B	U
15.	SLO: C-09-B-20 (Isotopes): Define isotopes as different atoms of the same element that have same number of protons but different neutrons	0.5	B	U
16.	SLO: C-09-B-19 / B-22 (Atomic particles comparison): Define nucleon number/atomic mass as sum of number of protons and neutrons in the nucleus of an atom. / Determine the number of protons and neutrons of different isotopes.	0.5	B	K
17.	SLO: C-09-B-38 (Electrical conductivity in ionic compounds): Justify the availability of free charged particles (electrons or ions) for conduction of electricity in ionic compounds (solid in molten) covalent compounds and metallic bonds.	0.5	B	U
18.	SLO: C-09-B-63 (Endothermic change): Differentiate between exothermic and endothermic reactions by giving examples.	0.5	B	A
19.	SLO: C-09-B-68 / B-69 (Bond energy concept) : Recognize that bond breaking is endothermic and bond making is exothermic processes / Explain that enthalpy change is sum of energies absorbed and released in bond breaking and bond forming.	0.5	B	U
20.	SLO: C-09- B-67 (Enthalpy sign + energy profile): State that thermal energy is called enthalpy change and recognize its sign as negative for exothermic and positive for endothermic reactions. / Draw, label and interpret reaction pathway diagram for exothermic and endothermic reaction which includes enthalpy change, activation energy (uncatalyzed and catalyzed), reactants and products	0.5	B	A
21.	SLO: C-09-B-50 / B-51 (Balancing equations): Construct chemical equations and ionic equations to show reactants forming products, including state symbols. / Deduce the symbol equation with state symbols for a chemical reaction given relevant information.	0.5	B	A
22.	SLO: C-09-B-45 (Empirical formula): Define empirical formula of a compound as the simplest whole number ratio of different atoms in a molecule	0.5	B	A
23.	SLO: C-09-B-47 / B-48 (Mole concept): Use the relationship. Amount of substance = mass / molar mass to calculate number of moles, mass, molar mass, relative mass (atomic/molecular/formula) and number of particles. / Define mole as amount of substance containing Avogadro's number (6.02×10^{23}) of particles.	0.5	B	A
24.	SLO: C-09-B-51 (Chemical equation writing): Deduce the symbol equation with state symbols for a chemical reaction given relevant information.	0.5	B	A
25.	SLO: C-09- B-49 (Avogadro number): Define mole as amount of substance containing Avogadro's number (6.02×10^{23}) of particles. / Explain the relationship between a mole and Avogadro's constant	0.5	B	U
26.	SLO: C-09- E-10 (Alkanes properties): Interpret general formulae of compounds in the same homologous series including alkanes, alkenes, alkynes, alcohols and carboxylic acids. / State that the bonding in alkanes is single covalent and that alkanes are saturated hydrocarbons.	0.5	E	K

27.	SLO: C-09-E-07 (Homologous series): Describe the general characteristics of a homologous series (These can include: a. Having the same functional group. b. Having the same general formula. c. Differing from one member to the next by a $\text{—CH}_2\text{—}$ unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties).	0.5	E	U
28.	SLO: C-09-E-05 (Isomerism): Define structural isomers as compounds with the same molecular formula, but different structural formulae, including C_4H_{10} as $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}_3$; and C_4H_8 as $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ and $\text{CH}_3\text{CH}=\text{CHCH}_3$	0.5	E	U
29.	SLO: C-09-D-08 (Catalytic converter gases) : Explain how oxides of nitrogen form in car engines and describe their removal by catalytic converters, e.g. $\text{CO} + 2\text{NO} \rightarrow 2\text{CO} + \text{N}_2$	0.5	D	U
30.	SLO: C-09-D-01 (Composition of air): State that composition of clean, dry air is approximately 78% Nitrogen N_2 , 21% Oxygen O_2 , and the remainder as a mixture of noble gases and carbon dioxide CO_2	0.5	D	K
31.	SLO: C-09-B-81 (Bases + ammonium salts reaction): Identify the characteristic properties of bases in terms of their reactions with acids and ammonium salts.	0.5	E	U
32.	SLO: C-09-B-80 (Acid reactions): Describe the characteristic properties of acids in terms of their reactions with metals, bases and carbonates.	0.5	B	U
33.	SLO: C-09-B-50 (Ionic equation): Construct chemical equations and ionic equations to show reactants forming products, including state symbols	0.5	B	A
34.	SLO: C-09-B-73 : Describe how changing the physical conditions of a chemical equilibrium system can redirect reversible reactions. a. effect of heat on hydrated compounds b. addition of water to anhydrous substances in particular copper(II) sulfate and cobalt (II) chloride	0.5	B	U
35.	SLO: C-09-B-52 (Redox reactions): Define redox reactions as simultaneous oxidation and reduction in terms of oxygen, hydrogen, electrons and changes in oxidation state.	0.5	B	K
36.	SLO: C-09-B-60 (Redox identification via color change): Identify redox reactions by the colour changes involved when using acidified aqueous potassium manganate (VII) to (II) or aqueous potassium iodide.	0.5	B	U
37.	SLO: C-09-E-16 (Biomolecules – proteins): Recognize the main biomolecules; carbohydrates, proteins, lipids and nucleic acids, their sources, along with the required daily intake for young adults.	0.5	E	U
38.	SLO: C-09-B-76 / B-79 (Acids, bases, pH) : Recognize that aqueous solutions of acids contain H^+ ions and aqueous solutions of alkalis contain OH^- ions. / Recognize that bases are oxides or hydroxides of metals and that alkalis are water-soluble bases	0.5	B	K
39.	SLO: C-09-C-04 (Group behavior – valence electrons) : Explain similarities in the chemical properties of elements in the same group in terms of their electronic configuration.	0.5	C	U
40.	SLO: C-09-C-05 (Atomic size trend) : Identify trends in group and periods, given information about the elements, including trends for atomic radius, electron affinity, electronegativity, ionization energy, metallic character, reactivity and density.	0.5	C	U
41.	SLO: C-09-A-02 (Subfields of chemistry): Explain with examples that chemistry has many sub-fields and example, and interdisciplinary fields. (Some examples includes). Biochemistry. Medicinal Chemistry. Polymer Chemistry. Geochemistry. Environmental Chemistry. Analytical Chemistry. Physical	0.5	C	K

	Chemistry. Organic Chemistry			
42.	SLO:C-09-A-02 (Subfields of chemistry): Explain with examples that chemistry has many sub-fields and example, and interdisciplinary fields. (Some examples includes). Biochemistry. Medicinal Chemistry. Polymer Chemistry. Geochemistry. Environmental Chemistry. Analytical Chemistry. Physical Chemistry. Organic Chemistry	0.5	C	K
43.	SLO:C-09-A-02 (Subfields of chemistry): Explain with examples that chemistry has many sub-fields and example, and interdisciplinary fields. (Some examples includes). Biochemistry. Medicinal Chemistry. Polymer Chemistry. Geochemistry. Environmental Chemistry. Analytical Chemistry. Physical Chemistry. Organic Chemistry	0.5	C	K
44.	SLO: C-09-A-03 (Importance of branches) : Formulate examples of essential question(s) that are important for the branches of Chemistry. e.g. for Analytical Chemistry a question would be 'how can we accurately determine the chemical composition of a sample?')	0.5	A	U
45.	SLO: C-09-B-03 (States of matter) : Identify that state is a distinct form of matter (examples could include familiarity with plasma, intermediate states and exotic states e.g. BEC or liquid crystals).	0.5	B	U
46.	SLO: C-09-B-01 (Nature of matter): Define matter as a substance having mass and occupying space	0.5	B	K
47.	SLO: C-09-B-02 (Particle behavior) : State the distinguishing macroscopic properties of commonly observed states of solids, liquids and gasses in particular density, compressibility and fluidity.	0.5	B	U
48.	SLO: C-09-B-05 (No new substance formed) : Explain the differences between elements, compounds and mixtures.	0.5	B	K
49.	SLO: C-09-B-19 (Mass number) : Define nucleon number/atomic mass as sum of number of protons and neutrons in the nucleus of an atom.	0.5	B	K
50.	SLO: C-09-C-02 (Group & period) : Identify the group or period or block of an element using its electronic configuration (only the idea of subshells related to the blocks can be introduced).	0.5	C	K
51.	SLO: C-09-C-02 (Electronic configuration) : Identify the group or period or block of an element using its electronic configuration (only the idea of subshells related to the blocks can be introduced).	0.5	C	U
52.	SLO: C-09-B-16: Define proton number/atomic number as the number of protons in the nucleus of an atom.	0.5	B	K
53.	SLO: C-09-E-07: Describe the general characteristics of a homologous series (These can include: a Having the same functional group. b. Having the same general formula. c. Differing from one member to the next by a—CH ₂ — unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties).	0.5	E	U
54.	SLO: C-09-E-07: Describe the general characteristics of a homologous series (These can include: a Having the same functional group. b. Having the same general formula. c. Differing from one member to the next by a—CH ₂ — unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties).	0.5	E	U

55.	SLO: C-09-E-06 (Functional group) : Identify a functional group as an atom or group of atoms that determine the chemical properties of a homologous series, including alcohols, aldehydes, ketones, phenols, carboxylic acids, amine, esters, and amide	0.5	E	K
56.	SLO: C-09-E-07 : Describe the general characteristics of a homologous series (These can include: a Having the same functional group. b. Having the same general formula. c. Differing from one member to the next by a—CH ₂ — unit. d. displaying a trend in physical properties. e. Sharing similar chemical properties).	0.5	E	U
57.	SLO: C-09-D-03 : State the adverse effects of air pollutants (Some examples include: a. carbon dioxide: higher levels of carbon dioxide leading to increased global warming, which leads to climate change b. carbon monoxide: toxic gas c. particulates: increased risk of respiratory problems and cancer d. methane: higher levels of methane leading to increased global warming, which leads to climate change e. oxides of nitrogen: acid rain, photochemical smog and respiratory problems, f. sulfur dioxide: acid rain and haze).	0.5	D	U
58.	SLO: C-09-D-03 : State the adverse effects of air pollutants (Some examples include: a. carbon dioxide: higher levels of carbon dioxide leading to increased global warming, which leads to climate change b. carbon monoxide: toxic gas c. particulates: increased risk of respiratory problems and cancer d. methane: higher levels of methane leading to increased global warming, which leads to climate change e. oxides of nitrogen: acid rain, photochemical smog and respiratory problems, f. sulfur dioxide: acid rain and haze).	0.5	D	U
59.	SLO: C-09-D-04 (Greenhouse gases): Explain how the greenhouse gasses carbon dioxide and methane cause global warming? (Some examples include: a. The absorption, reflection and emission of thermal energy, b. Reducing thermal energy loss to space).	0.5	D	U
60.	SLO: C-09-D-02 (Sources of pollutants) : State the major sources of air pollutants. (Some examples include: a. Carbon dioxide from the complete combustion of carbon-containing fuels, b. Carbon monoxide and particulates from the incomplete combustion of carbon-containing fuels, c. methane from the decomposition of vegetation and waste gasses from digestion in animals. d, Oxides of nitrogen from car engines, e. Sulfur dioxide from the combustion of fossil fuels which contain sulfur compounds f. Ground level ozone from reactions of oxides of nitrogen, from car engines, and volatile organic compounds, in presence of light).	0.5	D	U

*K= Knowledge

*U= Understanding

*A= Application

Table of Specification of the Model Paper Chemistry----- Grade – IX
(SSC-I)

Content Domains	Nature of Science in Chemistry	Matter	Atomic Structure	Chemical Bonding	Stoichiometry	Electro chemistry	Energetics	Chemical Equilibrium	Acids, Bases chemistry and pH	Periodic Table and Periodicity	Group Properties and Elements	Environmental Chemistry-Air
Cognitive Levels												
Knowledge	41-43	2, 46, 48	4-5, 16, 49, 52		24	35	19		38		11	30
Understanding	44	1, 3, 45, 47	15,	14, 17	25	8, 9, 36	18	34	31,32,	39, 40, 50, 51		29,57, 58, 59,60
Application			6		7, 21,22, 23,33		20				10	
Total	02	3.5	3.5	1	3.5	02	1.5	0.5	1.5	2	01	03
Percentage	6.66	11.66	11.66	3.33	11.66	6.66	05	1.66	05	6.66	3.33	10

Cont....

Table of Specification of the Model Paper Chemistry----- Grade – IX
(SSC-I)

Content Domains Cognitive Levels	Environmental Chemistry-Water	Organic Chemistry	Hydrocarbons	Biochemistry	Scientific Notation/Standard Form	Separation Techniques	Qualitative Analysis	Chromatography	Total marks for each Assessment Objective	%age
Knowledge		55	26		Formative for theory and only two, SLO C-09-F-04 and SLO C-09-F-09 are Summative for PBA	Summative for PBA	Summative for PBA	Summative for PBA	9	26.66%
Understanding		12, 13, 27, 28, 52, 53, 54,56		37					17	53.33 %
Application									4	20 %
Total marks for each Topic/Subtopic		4	0.5	0.5	00	00	00	00	30	-
Percentage	0	13.33	1.66	1.66	00	00	00	00	-	99.99%

Note:

- 1 This ToS does not reflect policy, but it is particular to this model question paper.
- 2 Proportionate / equitable representation of the content areas may be ensured.
- 3 The percentage of cognitive level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with $\pm$ 5% variation. The domain of Application also contains all other higher order Cognitive Levels of Bloom's Taxonomy.
- 4 While selecting alternative questions for SRQs and ERQs, it must be kept in mind that:
 - Difficulty levels of the two alternative questions of the internal choice will be same
 - SLOs of the two alternative questions of the internal choice must be different

Key: Question Number (part/ first choice) marks example: Q2 (i / f)3 ,
Question Number (part/ second choice) marks Q2 (i / s) 3



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