

POLICY GUIDELINES FOR SCIENCE SUBJECTS PAPERS

Paper Pattern and Distribution of Marks

Chemistry HSSC-I

The question paper is organized into **FOUR** sections, namely: "Section A, B, C & D". Questions posed may be text based or derived/unseen but in similar pretext and difficulty level as per the lessons taught in the course. Distribution of the questions with respect to cognitive domain within each section shall roughly be around 30 percent Knowledge (K), 50 percent Understanding (U) and 20 percent Application (A).

The Questions in these subjects will be designed in such a manner that no pet-definitions are required from the candidates to be reproduced. Moreover the questions will be designed keeping in consideration the time for thought-process (particularly in U and A Cognitive Domain questions) and the length of the subsequent text (if any) to be produced by the candidates.

SECTION — A

This section consists of 17 compulsory structured part questions - Multiple Choice Questions (MCQs) of one mark each. These MCQs will preferably be designed in such a way to cover the whole course taught. These MCQs objectively test the knowledge, understanding and comprehension of the concepts of the candidates in these subjects.

SECTION — B

This section consists of question number two (02) with preferably **TEN** part questions – Short Response Questions (SRQs) of three (03) marks each. The candidates are required to attempt (respond to) any **SEVEN** SRQs for a maximum total of 21 marks in this section.

SECTION — C

This section consists of question number three (03) with preferably **TEN** part questions – Short Response Questions (SRQs) of three (03) marks each. The candidates are required to attempt (respond to) any **SEVEN** SRQs for a maximum total of 21 marks in this section.

SECTION — D

This section consists of three (03) Extended Response Question (ERQs) of 13 marks each. Candidates are required to attempt (respond to) any two of these ERQs as per their choice and convenience for a maximum of 26 marks. These questions may comprise of two or more part questions each if deemed necessary by paper setter in order to balance out the distribution various concepts and knowledge areas from different Cognitive Domains taught in course. However none of the part questions shall be of less than 6 Marks.

Annexure for Policy Guidelines for Paper Setting

Definitions and Disclaimer

Policy guidelines for paper setting vide Notification No.6-8/FBISE/RES/CC/918 dated 27 August 2019 have been conveyed for general information. Definitions of some terminologies and disclaimers are given in this annexure.

1. Definitions

I. Cognitive Domains

Cognitive domain refers to development of mental skill and acquisition of knowledge.

In the questions papers developed by Federal Board of Intermediate & Secondary Education, Islamabad from hereon will be intended to test the following cognitive domains of the candidates:

- Knowledge: Approximately 30% Question in each section
- Understanding: Approximately 50% Question in each section
- Application: Approximately 20% Question in each section

i. Knowledge (K)

Knowledge refers to the ability of the candidates to recall the learned or memorized information or data.

Examples

- A child reciting the alphabets of English
- Memorization and reproducing the dates and other facts etc.
e.g. Pakistan came into being on 27th Night of Ramadan-ul-Mubarak.

Related Verbs (Command Words)

Arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, state etc.

ii. Understanding (U)

Understand (also called Comprehension) refers to ability of the candidates to comprehend (a set of) information and/or situation and provide his/her response to it accordingly.

Examples

- Performing analyses and illustrating the observations
- Comprehending the concepts of Social, Natural and Physical Sciences
e.g. Discuss different types of noise and their impact on human health briefly.

Related Verbs (Command Words)

Classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate, rephrase, differentiate, compare etc.

iii. Application (A)

Application refers to the ability to use learned material in new and concrete situation to solve problems and/or to design a schedule or task.

Examples

- Performing analyses and illustrating the observations
- Comprehending the concepts of Social, Natural and Physical Sciences
e.g. Illustrate the similes and metaphors given in the poem Daffodils.

Related Verbs (Command Words)

Apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write etc.

II. Sections of Paper

There are three or four (03 or 04) sections in each question paper:

i. Section-A

Contains Multiple Choice Questions (MCQs). All questions are compulsory without any external or internal choice. Usually comprises of 20% of total marks of the (theory if applicable) paper.

ii. Section B

Contains Short Response Questions (SRQ). Candidates may have external choice up to 33%. In addition to that internal choice may also be offered based upon model, content and/or nature of the subject.

- This section may contain approximately 50% of total marks in some of subjects of the (theory if applicable) paper.

iii. Section C

This section usually contains Extended Response Questions (ERQ). Candidates may have external choice in the questions. In addition to that internal choice may also be offered based upon model, content and/or nature of the subject. For ERQs it may contain approximately 30% of total marks in some subjects of the (theory if applicable) paper.

III. Choice

Sometimes the candidates are required to attempt a certain number of questions from a given pool or group of questions, it is commonly known as choice in questions.

There are two types of choices

i. External Choice

Whenever the candidates are required to solve (respond to) a certain number of questions from a given pool it is called external choice. This choice may be around 33% in a section.

- e.g.
1. Answer any six parts in about 30-40 words each.
(Out of eight questions)
 2. Attempt any eight questions from the following.
(Out of eleven questions)

ii. Internal Choice

Whenever the candidates have to solve (respond to) a question mandatorily but they have an option within the question it is called internal choice.

2. Disclaimers

- I.** The cognitive levels and categories written in sample model paper are for explanation purpose only. In the actual question papers administered during examination shall not contain description of these cognitive domains.
- II.** Association of the cognitive domains is solely based on subject expert's judgment and may be subject to errors and/or omissions.
- III.** In the class rooms and during teaching the candidates (students) need to be taught about the time management in accordance with allocation of marks to the questions.



Federal Board HSSC-I Examination
Chemistry Model Question Paper

Time allowed: 2.35 hours

Total Marks: 68

Note: Sections 'B' 'C' and 'D' comprise pages 1-2 and questions therein are to be answered on the separately provided Answer Book. Use supplementary answer sheet i.e., sheet B if required. Write your answers neatly and legibly.

SECTION – B (Marks 21)
(Chapter 1-6)

Q.2 Attempt any **SEVEN** parts from the following. All parts carry equal marks. ($7 \times 3 = 21$)

- i. A limiting reactant controls the amount of the product in a chemical reaction. Justify.
- ii. Law of conservation of mass has to be obeyed during stoichiometric calculations. Explain with an example.
- iii. Energy of revolving electron is given by the formula $= -\frac{mz^2e^4}{8\epsilon_0^2n^2h^2}$. Calculate ionization energy of hydrogen.
- iv. Explain why MOT is a more acceptable theory than VBT?
- v. A photon of light with energy 10^{-14}J is emitted by a source. Find the wave number (ν) associated with this energy. (Planck's constant = 6.625×10^{-34} J.S, Speed of light = 3×10^8 ms^{-1})
- vi. Why do the lone pairs of electron on an atom occupy more space than the bond pairs? Explain with the example of NH_3 .
- vii. Justify; why Bromine is a liquid and Iodine is a solid at room temperature?
- viii. What are the factors on which lattice energy depends?
- ix. What is meant by **Bond Enthalpy**? Mention its units and also give one example.
- x. What are the applications of H- bonding?

SECTION – C (Marks 21)
(Chapter 7-12)

Q.3 Attempt any **SEVEN** parts from the following. All parts carry equal marks. ($7 \times 3 = 21$)

- i. Consider the following reaction;
 $\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO} \quad K_c = 0.1 \text{ at } 1500 \text{ C}$
If original concentration of N_2 and O_2 were 0.1M each. Calculate the concentration of NO at equilibrium.
- ii. a. What is the pH of a solution containing 1.7g of pure H_2SO_4 per dm^3 of solution?
b. Classify each of the following as Bronsted Acid or Bronsted Base
(i) HCO_3^{-1} (ii) HBr (iii) $\text{CH}_3\text{COO}^{-1}$
- iii. The rate of a chemical reaction depends upon the reacting molecules. Justify.
- iv. Give three chemical reactions in which Heterogeneous Catalysis takes place.

- v. Differentiate between heat capacity and molar heat capacity.
- vi. How can the reverse osmosis be applied in daily life?
- vii. Specify the conditions for **Standard Heat of Reaction**.
- viii. Calculate standard enthalpy of formation of SO_2 with the help of given equations.
 $\text{S}_{(\text{s})} + 3/2 \text{O}_{2(\text{g})} \longrightarrow \text{SO}_{3(\text{g})} \quad \Delta H^\circ = -395.2 \text{ kJ}$
 $2\text{SO}_{2(\text{g})} + \text{O}_{2(\text{g})} \longrightarrow 2\text{SO}_{3(\text{g})} \quad \Delta H^\circ = -198.2 \text{ kJ}$
- ix. How does the process of corrosion take place? Explain with the help of an example.
- x. Balance the following reaction by ion electron method.
 $\text{IO}_3^{-1} + \text{AsO}_3^{-3} \longrightarrow \text{I}^{-1} + \text{AsO}_4^{-3}$

SECTION – D (Marks 26)

Note: Attempt any **TWO** questions. All questions carry equal marks. (2×13 = 26)

- Q.4** a. When an electric discharge is passed through hydrogen gas, the hydrogen molecules dissociate to produce excited hydrogen atoms. These excited atoms emit electromagnetic radiation of discrete frequencies which can be given by the general formula

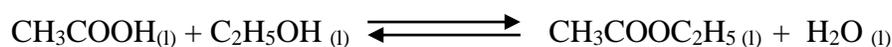
$$\bar{\nu} = 1.09678 \times 10^7 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) m^{-1}$$

Based on Bohr's postulates, derive the above formula giving description of each step and each term. (7)

- b. Use the molecular orbital energy level diagram to show that N_2 would be expected to have a triple bond, F_2 , a single bond and Ne_2 , no bond. (6)

- Q.5** a. The lattice enthalpy of an ionic compound is the enthalpy when one mole of an ionic compound present in its gaseous state, dissociates into its ions. It is impossible to determine it directly by experiment. Suggest and explain an indirect method to measure lattice enthalpy of $\text{NaCl}(\text{s})$. (6)

- b. Ethyl acetate is formed by the reaction between ethanol and acetic acid and the equilibrium is represented as: (7)



- (i) Write the concentration ratio (reaction quotient), Q_c , for the reaction.
(Note: water is not in excess and is not a solvent in this reaction)
- (ii) At 293 K, if one starts with 1.00 mol of acetic acid and 0.18 mol of ethanol, there is 0.171 mol of ethyl acetate in the final equilibrium mixture, Calculate its equilibrium constant.
- (iii) Starting with 0.5 mol of ethanol and 1.0 mol of acetic acid and maintaining it at 293 K, 0.214 mol of ethyl acetate is found after some time, has equilibrium been reached?

- Q.6** a. A vessel contains 1.6 g of Oxygen gas at STP (273.15K, 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes half of the original pressure. Determine: (6)
- (i) volume of the new vessel.
- (ii) number of molecules of Oxygen.
- b. What is "rate of reaction"? How is it affected by surface area and temperature? Explain in detail. (7)

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