



Delhi Public School, Howrah

PERIODIC TEST - I (2024-2025)
CLASS-XI

Care must be taken not to write anything on the question paper. All the questions must be attempted in the correct sequence.

SUBJECT: CHEMISTRY (CODE-043)

TIME: 3 HOURS

F.M.: 70

General Instructions:

Read the following instructions carefully.

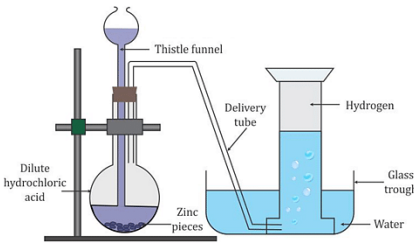
- There are 33 questions in this question paper with internal choice.
- SECTION A consists of 16 multiple choice questions carrying 1 mark each.
- SECTION B consists of 5 short answer questions carrying 2 marks each.
- SECTION C consists of 7 short answer questions carrying 3 marks each.
- SECTION D consists of 2 case - based questions carrying 4 marks each.
- SECTION E consists of 3 long answer questions carrying 5 marks each.
- All questions are compulsory.
- Use of log tables and calculators is not allowed.

SECTION: A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1.	Select the correct order of effective nuclear charge in Na, Al, Mg and Si atoms. (a) $\text{Na} < \text{Mg} < \text{Si} < \text{Al}$ (b) $\text{Na} < \text{Mg} < \text{Al} < \text{Si}$ (c) $\text{Mg} < \text{Na} < \text{Al} < \text{Si}$ (d) $\text{Na} = \text{Mg} = \text{Al} = \text{Si}$	1
2.	Which of the following options does not represent ground state electronic configuration of an atom? (a) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ (b) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9 4s^2$ (c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ (d) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$	1
3.	Which of the following has the largest size? (a) P^{-3} (b) S^{-2} (c) K^{+1} (d) Ca^{+2}	1
4.	The screening effect of d - electrons is - (a) equal to the p - electrons (b) much more than p - electron (c) same as f - electrons (d) less than p - electrons	1
5.	Which expression represents de Broglie's relationship? (a) $h/mv = p$ (b) $\lambda = h/mv$ (c) $\lambda = h/mp$ (d) $\lambda = v/p$	1
6.	If a student wants to verify the law of conservation of mass, what does he need to weigh? (a) mass of reactants only	1

	(b) mass of products only (c) both the masses of reactants and products (d) weighing is not essential to verify law of conservation of mass	
7.	One mole of CH ₄ contains (a) 4 g atoms of hydrogen (b) 3 g atoms of carbon (c) 6.022×10 ²³ atoms of hydrogen (d) 1.83×10 ²³ molecules of CH ₄	1
8.	For which of the following sets of quantum numbers, an electron will have the highest energy? (a) 3, 2, +1, +1/2 (b) 4, 2, -1, +1/2 (c) 4,1, 0, -1/2 (d) 5,0, 0, +1/2	1
9.	The general electronic configuration of alkaline earth metals is (a) ns ² np ⁶ (b) ns ² np ³ (c) ns ² np ⁵ (d) ns ²	1
10.	Which of the following atoms or atom/ion have identical ground state electronic configuration? (a) Li ⁺ and He ⁺ (b) Cl ⁻ and Ar (c) Na and K (d) F ⁺ and Ne	1
11.	Ionization energy is lowest in (a) inert gases (c) halogens (b) alkali metals (d) alkaline earth metals	1
12.	The empirical formula and molecular mass of a compound is CH ₂ O and 180g respectively. Find the molecular formula of the compound. (a) CH ₂ O (b) C ₉ H ₁₈ O (c) C ₆ H ₁₂ O ₆ (d) C ₂ H ₂ O ₂	1
	Q. no 13 to 16 are Assertion - Reasoning based questions. These consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below: (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true and R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true.	
13.	Assertion: Nitrogen has higher ionisation energy than that of oxygen. Reason: Nitrogen atom has smaller atomic size than that of oxygen.	1
14.	Assertion: The 19 th electron in potassium atom enters 4s-orbital and not 3d orbital as 4s has lower energy. Reason: The energies of the orbitals can be compared with the help of (n+l) rules.	1
15.	Assertion: Chlorine has higher negative electron gain enthalpy than that of fluorine. Reason: Fluorine is stronger oxidizing agent than chlorine.	1
16.	Assertion: Combustion of 1 mole of methane gives 2 moles of water. Reason: In the combustion of methane, hydrogen is one of the products.	1
	SECTION: B This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.	
17.	Heisenberg uncertainty principle has no significance in our everyday life. Justify.	2

18.	<p>Hydrogen gas is prepared in the laboratory by reacting dilute HCl with granulated zinc.</p>  <p style="text-align: center;">Preparation of Hydrogen gas</p> <p>During this, the following reaction takes place. $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ Calculate the volume of hydrogen gas liberated at STP when 32.65 g of zinc reacts with HCl. 1 mol of a gas occupies 22.4 L volume at S.T.P. (Given, atomic mass of Zn = 65.3 u)</p> <p style="text-align: center;">OR</p> <p>The density of 3 molal solutions of NaOH is 1.110 g mL⁻¹. Calculate the molarity of the solution. (Given, atomic mass of Na=23u, O=16u, H=1u)</p>	2
19.	<p>44.8 L of dinitrogen reacted with 22.4 L of dioxygen and 44.8 L of nitrous oxide was formed. The reaction is given below:</p> $2\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{N}_2\text{O}(\text{g})$ <p>Which law is being obeyed in this experiment? Write the statement of the law?</p>	2
20.	How does the ionisation enthalpy of an element change along a period?	2
21.	Explain why we don't see a car moving as a wave on the road focusing on de Broglie hypothesis.	2
<p>SECTION: C</p> <p>This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.</p>		
22.	<p>If two elements can combine to form more than one compound, the masses of one element that combine with a fixed mass of the other element, are in whole number ratio.</p> <p>(a) Which law is related to the aforementioned statement? (b) Give an example related to this law. Explain with proper justification.</p>	3
23.	<p>(a) How many electrons can be filled in all the orbitals with $n+l=5$? (b) Why are 2d and 3f orbitals not possible?</p>	3
24.	The first ionisation enthalpy of magnesium is higher than that of sodium. On the other hand, the second ionisation enthalpy of sodium is very much higher than that of magnesium. Explain with electronic configuration of both the elements.	3
25.	<p>(a) State law of definite proportions with suitable example. (b) The reactant which is entirely consumed in the reaction is known as limiting reagent. In the reaction $2\text{A} + 4\text{B} \rightarrow 3\text{C} + 4\text{D}$, when 5 moles of A react with 6 moles of B, then which is the limiting reagent?</p>	3
26.	<p>Write the electronic configuration of ${}_{17}\text{Cl}^{35}$, ${}_{16}\text{S}^{32}$ and ${}_{18}\text{Ar}^{38}$ and then point out the element with</p> <p>(a) Maximum nuclear charge. (b) Minimum number of neutrons. (c) Maximum number of unpaired electrons.</p> <p style="text-align: center;">OR</p> <p>Assign the position of the element in modern periodic table having outer electronic configuration</p> <p>(a) ns^2np^4 for $n=3$ (b) $(n-1)d^2ns^2$ for $n=4$ (c) $(n-2)f^7(n-1)d^1ns^2$ for $n=6$</p>	3
27.	An electron is moving with a speed of 40 ms^{-1} accurate upto 99.9 percent. What is the uncertainty in locating its position? [Given, $m_e = 9.11 \times 10^{-31} \text{ kg}$]	3
28.	Yellow light emitted from a sodium lamp has a wavelength of 580 nm. Calculate the frequency and wave number of yellow light.	3

SECTION: D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

29. In the periodic table electronegativity increases from left to right in a period and decreases from top to bottom in a group. The non-metallic character of an element is directly related to the electronegativity while the metallic character is inversely related to it.

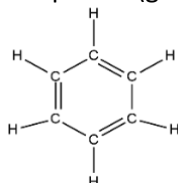
- (a) What is the position of the element with maximum electronegativity in periodic table?
 (b) Mention the factors affecting electronegativity.
 (c) Which element of group 13 has least metallic character? Explain.

OR

- (c) What is the cause of the periodicity in the properties of the elements? Explain.

30. The mass of one mole of a substance in grams is called its molar mass. The molar mass in grams is numerically equal to molecular/formula mass in u. An empirical formula represents the simplest whole number ratio of various atoms present in a compound, whereas, the molecular formula shows the exact number of different types of atoms present in a molecule of a compound. If the mass per cent of various elements present in a compound is known, its empirical formula can be determined. Molecular formula can further be obtained if the molar mass is known.

- (a) Define formula unit mass.
 (b) Write one point of difference between molecular formula and empirical formula.
 (c) Calculate molecular mass of the following compound (given, C=12u, H=1u)

**OR**

- (c) Calculate formula unit mass of NaOH. (given, Na=23u, O=16u, H=1u)

SECTION: E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. (a) What do you mean by molarity?
 (b) Calculate the molarity of NaOH in the solution prepared by dissolving its 4 g in enough water to form 250 mL of the solution. (given, Na=23u, O=16u, H=1u).
 (c) Analyse the effect of temperature on molarity and molality.

OR

- (a) What do you mean by mole fraction?
 (b) Calculate the average atomic mass of hydrogen using the following data:

Isotope	% Natural abundance
^1H	99.85
^2H	0.15

- (c) A crystalline salt when heated becomes anhydrous and loses 51.2% of its weight. The anhydrous salt on analysis gave the percentage composition as: Mg = 20.0%, S = 26.66% and O = 53.33%. Calculate the molecular formula of the anhydrous salt and crystalline salt. Molecular mass of the anhydrous salt is 120u. (Given, atomic masses of Mg=24 a.m.u., S=32 a.m.u., O= 16 a.m.u., H=1 a.m.u.)

32. From the elements: Cl, Br, F, O, Al, C, Li, Cs and Xe; choose the following:
 (a) The element with smallest ionic radius.
 (b) The element with six electrons in the valence shell.
 (c) The element which is a liquid at room temperature.
 (d) The element which belongs to zero group in Mendeleev's periodic table.
 (e) The elements which form the largest number of compounds.

OR

- (a) Explain why are cations smaller and anions larger in size than their parent atoms.
 (b) Arrange the following in increasing order of
 (i) electron gain enthalpy

	(ii) atomic radii. Explain your answer. F, Cl, Br, I	
33.	<p>(a) List two main differences between orbit and orbital.</p> <p>(b) Write outer electronic configuration of the following element.</p> <p style="text-align: center;">${}_{24}\text{Cr}^{51}$</p> <p>(c) Why are half filled orbitals more stable?</p> <p style="text-align: center;">OR</p> <p>(a) The two electrons in the 1s orbital of He have anti-parallel spin. Explain why they do not have parallel spin.</p> <p>(b) Which orbital is non directional?</p> <p>(c) Electronic configuration of Kr (Z=36) is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$. Find the orbitals of Kr having the same energies even for different azimuthal quantum numbers.</p>	5