



# Delhi Public School, Howrah

FINAL EXAMINATION (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

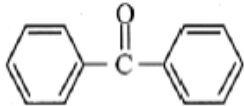
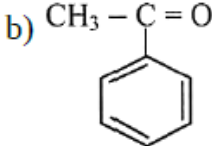
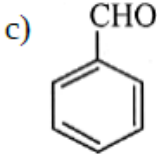
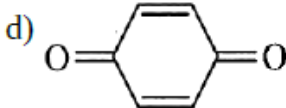
F.M.: 70

## 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		MARKS
	<b>The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.</b>	
1.	16 g of oxygen has same number of molecules as in a) 16 g of CO b) 28 g of N <sub>2</sub> c) 14 g of N <sub>2</sub> d) 10 g of H <sub>2</sub>	1
2.	In the combustion reaction of alkanes if Ethane is used how many moles of oxygen are required? a) 3 b) 4 c) 7 d) 3.5	1
3.	What is the change in the energy of system if 500 cal of heat energy are added to a system and system does 350 cal of work on the surroundings? a) +850 cal b) -150 cal c) +150 cal d) -850 cal	1
4.	Which one is strongest acid among the following options? a) CH <sub>2</sub> FCOOH b) CH <sub>2</sub> ClCOOH c) CHCl <sub>2</sub> COOH d) CHF <sub>2</sub> COOH	1

5.	<p>What is the shape of the orbital, whose "l" is 1?</p> <p>a) Spherical b) Dumbbell c) Double dumbbell d) Complex</p>	1
6.	<p>Suppose that 1.00 kJ of heat is transferred to 2.00 mol argon (at 298 K, 1 atm). What will be the final temperature if the heat is transferred at constant pressure?</p> <p>a) 301 K b) 335 K c) 322 K d) 376 K</p>	1
7.	<p>Chlorine, bromine, and iodine when combined with oxygen, have oxidation numbers</p> <p>a) +1 or any positive number b) -1 or any negative number c) -2 d) -1</p>	1
8.	<p>The following compound do not show keto-enol tautomerism, except</p> <p>a) </p> <p>b) </p> <p>c) </p> <p>d) </p>	1
9.	<p>The number of alkynes possible with molecular formula <math>C_4H_{10}O</math> is</p> <p>a) 7 b) 4 c) 2 d) 3</p>	1
10.	<p>The correct order for the elements arranged in atomic radii is</p> <p>a) <math>Li &lt; Be &lt; B &lt; C</math> b) <math>Li &gt; Be &gt; B &gt; C</math> c) <math>C &lt; Li &lt; Be &lt; B</math> d) <math>Be &lt; B &gt; C &lt; Li</math></p>	1
11.	<p>On the basis of thermochemical equations (A), (B) and (C), find out which of the algebraic relationships is correct:</p> <p>A. <math>C(\text{graphite}) + O_2(g) \rightarrow CO_2(g)</math> ; <math>\Delta_r H = x \text{ KJ mol}^{-1}</math></p> <p>B. <math>C(\text{graphite}) + \frac{1}{2} O_2(g) \rightarrow CO(g)</math> ; <math>\Delta_r H = y \text{ KJ mol}^{-1}</math></p> <p>C. <math>CO(g) + \frac{1}{2} O_2(g) \rightarrow CO_2(g)</math> <math>\Delta_r H = z \text{ KJ mol}^{-1}</math></p> <p>a) <math>x = y + z</math> b) <math>y = 2z - x</math></p>	1



	<p>a) gains an electron b) loses an electron. Give suitable example supporting your answer (no specific data is required).</p>	
25.	<p>a) Calculate the gram molecular mass of sugar having molecular formula <math>C_{12}H_{22}O_{11}</math>. b) Calculate i. The mass of 0.5 g molecule of sugar ii. Gram molecule of sugar in 547.2 g.</p>	3
26.	<p>a) Draw the Molecular Orbital diagram of <math>F_2^-</math>. b) What can you interpret from the result of bond order?</p>	3
27.	<p>A swimmer coming out from a pool is covered with a film of water weighing about 18g. How much heat must be supplied to evaporate this water at 298 K? Also, calculate the internal energy of vapourisation at 298K. Given, <math>\Delta_{\text{vap}}H^\circ</math> for water at 298K= 44.01kJ mol<sup>-1</sup>.</p>	3
28.	<p>Attempt <b>any three</b> of the following. a) What do you mean by resonance stabilisation energy? b) Write one significance of resonance stabilisation energy. c) Write resonance structures of <math>CH_3COO^-</math> and show the movement of electrons by curved arrows. d) Draw the orbital diagram showing hyperconjugation in propene. (Placement of H is not required).</p>	3
<p><b>SECTION: D</b> <b>The following questions are case-based questions. Each question has an internal choice and carries 4 (2+1+1) marks each. Read the passage carefully and answer the questions that follow.</b></p>		
29.	<p>Lattice energy is a measure of the strength of the ionic bonds in an ionic compound. It provides insight into several properties of ionic solids including their volatility, their solubility, and their hardness. The lattice energy of an ionic solid cannot be measured directly. However, it can be estimated with the help of the Born-Haber cycle. Generally, this quantity is expressed in terms of kilojoules per mole (kJ/mol). Lattice energy can be defined as the energy required to convert one mole of an ionic solid into gaseous ionic constituents. Alternately, it can be defined as the energy that must be supplied to one mole of an ionic crystal in order to separate it into gaseous ions in a vacuum via an endothermic process. Therefore, this quantity always holds a positive value. Some sources define lattice energy in the opposite manner, i.e. the amount of energy released when an ionic solid is formed from its gaseous ionic constituents via an exothermic process. According to this definition, lattice energy must always hold a negative value due to the electrostatic forces between them, the individual ions in an ionic lattice are attracted to each other. The strength of the electrostatic force of attraction is directly proportional to the magnitude of the charge held by the constituent ions, i.e. the greater the charge, the stronger the force of attraction and the stronger the lattice. For example, the lattice energy of calcium chloride is greater than that of potassium chloride despite the similarity in the crystal arrangements of these compounds. This is because the magnitude of the positive charge held by the calcium cation (+2) is greater than that held by the potassium cation (+1). As a consequence of this, the electrostatic forces of attraction are stronger in calcium chloride (than those in potassium chloride). Therefore, the lattice energy of <math>CaCl_2</math> is greater than that of KCl.</p> <p>a) <math>AlCl_3</math> has a higher lattice enthalpy than <math>MgCl_2</math>. Explain.</p> <p style="text-align: center;"><b>OR</b></p> <p>a) Draw the Born haber cycle of CaO. b) List the lattice energies of lithium halides in decreasing order. c) Which of the two salts, NaCl or CsCl, has the higher lattice energy and why?</p>	4
30.	<p>Alicyclic compounds (aliphatic cyclic) are made up of carbon atoms arranged in a ring (homocyclic). Other atoms than carbon are known to exist in the ring (heterocyclic). A heterocyclic compound is an organic compound in which one or more of the carbon atoms in the backbone of the molecule has been replaced by an atom other than carbon. Some of its properties are similar to those of aliphatic compounds. Aromatic compounds are a class of</p>	4

	<p>chemicals. Examples include benzene and other similar ring compounds (benzenoid). Benzenoid compounds contain at least one benzene ring in the molecule whereas non benzenoid compounds have no benzene rings. Aromatic compounds can also have a heteroatom in the ring. This type of compound is known as a heterocyclic aromatic compound.</p> <p>a) Why is benzene extraordinarily stable though it contains three double bonds?</p> <p style="text-align: center;"><b>OR</b></p> <p>a) Why do aromatic compounds undergo electrophilic substitution reaction?  b) Which rule is used to determine the aromaticity of an organic compound?  c) Give an example of heterocyclic aromatic compound.</p>	
	<b>SECTION: E</b>	
	<b>The following questions are long answer type and carry 5 marks each. All questions have an internal choice.</b>	
31.	<p>Attempt <b>any five</b> of the following:</p> <p>a) Why does the iodination of benzene is carried out in the presence of nitric acid or iodic acid?  b) Can a catalyst change the position of equilibrium in a reaction?  c) Bring out the following conversion ethane to ethene.  d) Why are alkanes called paraffins?  e) Draw the Newmann's projection formula of the staggered form of 1,2-dichloroethane.  f) Give the IUPAC name of the lowest molecular weight alkane that contains a quaternary carbon.</p>	<b>5</b>
32.	<p>a) Dual behaviour of matter proposed by de Broglie led to the discovery of electron microscope often used for the highly magnified images of biological molecules and other type of material. If the velocity of the electron in this microscope is <math>1.6 \times 10^6 \text{ ms}^{-1}</math>, calculate de Broglie wavelength associated with this electron.  b) Calculate the wavelength for the emission transition if it starts from the orbit having radius 1.3225 nm and ends at 211.6 pm. Name the series to which this transition belongs and the region of the spectrum.</p> <p style="text-align: center;"><b>OR</b></p> <p>a) Write the significance of each quantum numbers (minimum 2 for each).  b) The Vividh Bharati station of All India Radio, Delhi, broadcasts on a frequency of 1,368 kHz. Calculate the wavelength of the electromagnetic radiation emitted by transmitter. Which part of the electromagnetic spectrum does it belong to?</p>	<b>5</b>
33.	<p>a) Write the working principle of an acidic buffer with example.  b) How does pH vary with temperature? Explain.  c) When does <math>K_c</math> becomes equal to <math>K_p</math>?</p> <p style="text-align: center;"><b>OR</b></p> <p>a) Write "Le Chatelier's principle".  b) Write Lewis acid base theory. Classify the following species into Lewis acids and Lewis bases stating reasons:  i. <math>\text{HO}^-</math>    ii. <math>\text{F}^-</math>    iii. <math>\text{H}^+</math>    iv. <math>\text{BCl}_3</math>  c) Write the effect of inert gas addition on equilibrium if the volume is kept constant.</p>	<b>5</b>