



B K BIRLA CENTRE
FOR EDUCATION
(Sarla Birla Group of Schools)

BK BIRLA CENTRE FOR EDUCATION
SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY | CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

MID-TERM EXAMINATION 2023-24

CHEMISTRY (43)



INDIAN PUBLIC SCHOOLS'
CONFERENCE

Class : XI

Date : 16/9/24

Duration: 3 Hrs

Max. Marks: 70

Name:

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.

- The number of atoms in 1.7 grams of NH_3 is approximate. (At. Mass of N=14 and H=1) 1
(a) 4×10^{23} (b) 2×10^{23} (c) 1×10^{23} (d) 6×10^{22}
- The mass of an atom is the sum of 1
(a) neutron and proton (b) electron and proton (c) electron only (d) proton only
2. Which of the following pairs of gases contains the same number of molecules? 1
(a) 16 g of O_2 and 14 g of N_2 (b) 28 g of N_2 and 22 g of CO_2
(c) 6 g of O_2 and 22 g of CO_2 (d) 32 g of CO_2 and 32g of N_2
- The maximum number of atomic orbitals associated with a principal quantum number 2 is:
(a) 9 (b) 4 (c) 16 (d) 25
- Orbital which is not possible is 1
(a) 2p (b) 3s (c) 3d (d) 3f
- Number of unpaired electrons in $1s^2 2s^2 2p^6$ is: 1
(a) 2 (b) 0 (c) 3 (d) 1
- Principal, Azimuthal and magnetic quantum numbers are respectively related to: 1
(a) Size, shape and orientation (b) Size, orientation and shape
(c) Shape, size and orientation (d) None of the above

8. Outer electronic configuration of f- block elements is 1
- (a) $(n+1)f^{1-14}(n-1)d^{0-1} ns^2$ (b) $(n-2)f^{1-14} (n-1) d^{0-1} ns^2$
- (b) $(n-2) f^{1-14} (n+1) d^{0-1} ns^2$ (d) None of the above
9. The symbol and name according to the IUPAC system for the element with atomic number 120, respectively are 1
- (a) Ubn and unbinilium (b) Ubn and unnilbium (c) Ubn and unbiunium (d) Ubn and unnilium
10. The element in which electrons are progressively filled in 4 f -orbital are called 1
- (a)actinoids (b)lanthanoids (c)transition elements (d)halogens
11. An atom of an element A has one electron in its outermost orbit and that of B has seven electrons in its outermost orbit. The formula of the compound between these two will be 1
- (a) A_3B_6 (b) A_2B_3 (c) AB_2 (d) AB
12. Which of the following angles corresponds to sp^2 -hybridisation? 1
- (a) 90° (b) 180° (c) 120° (d) 109°

Directions: The questions (from 13 to 16) below consist of an assertion and a reason.

Use the following key to choose the appropriate answer.

- (a) If both assertion and reason are correct and reason is correct explanation of the assertion.
 (b) If both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
 (c) If assertion is correct, but reason is incorrect.
 (d) If assertion is incorrect, but reason is correct.
13. Assertion : Atomic mass of Na is 23. 1
 Reason : An atom of sodium is 23 times heavier than 1/12th mass of C-12 isotope
14. Assertion: Black body is an ideal body that emits and absorbs radiations of all frequencies. 1
 Reason: The frequency of radiation emitted by a body goes from a lower frequency to higher frequency with an increase in temperature.
15. Assertion: The atomic and ionic radii generally decrease toward the right in a period. 1
 Reason: The ionisation enthalpy increases on moving toward left in a period.
16. Assertion: Atoms can combine either by transfer of valence of electrons from one atom to another or by sharing of valence electrons. 1
 Reason: The sharing and transfer of valence electrons is done by atoms to have an octet in their valence shell.

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. A solution is prepared by adding 2g of a substance A to 18g of water. Calculate the mass percent of the solute. 2
18. Calculate the molar mass of the following: atomic Masses of (H=1,S=32,O=16 and C=12) 2
- (i) CH_4 (ii) H_2SO_4

19. Calculate the frequency of a photon with wavelength 3.6 Å. 2

OR

What will be the de-Broglie wavelength of a ball of mass 0.01 kg moving with a velocity of 10ms^{-1} ?

20. Why is the atomic radius of the cation smaller than the parent atom? 2

21. Write Lewis dot symbols for the following atoms 2

(a) Li (b) Cl

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Explain the following terms with suitable examples: 3

(i) Molarity

(ii) Molality

(iii) Mole fraction

23. Calculate the amount of water (g) produced by the combustion of 16 g of methane. 3

24. Which atoms are indicated by the following configurations? 3

(a) $[\text{He}] 2s^2$ (b) $[\text{Ne}] 3s^2 3p^5$ (c) $[\text{Ar}] 4s^2 3d^1$

25. The threshold frequency ν^0 for a metal is $7.0 \times 10^{14} \text{ s}^{-1}$. Calculate the kinetic energy of an electron emitted when radiation of frequency $\nu = 1.0 \times 10^{15} \text{ s}^{-1}$ hits the metal. 3

26. Write all the properties of p-block elements. 3

OR

Write all the properties of d- block elements.

27. Define Covalent Bond. Explain all the types of covalent bond with suitable examples. 3

28. Find the formal Charge of all the oxygen atom in O_3 molecule. 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. The set of numbers used to describe the position and energy of the electron in an atom are called quantum numbers. There are four quantum numbers, namely, principal, azimuthal, magnetic and spin quantum numbers. The values of the conserved quantities of a quantum system are given by quantum numbers. Electronic quantum numbers (the quantum numbers describing electrons) can be defined as a group of numerical values which provide solutions that are acceptable by the Schrodinger wave equation for hydrogen atoms.

(a) Give one significance of principal Quantum number. 1

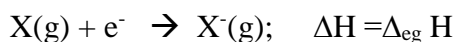
- (b) Give one significance of magnetic quantum number. 1
(c) What will be the value of n and l for 2p and 3d orbitals. 2

OR

- (c) Using s, p, d, f notations, describe the orbital with the following quantum numbers. 2

$$n = 2, l = 1 \quad n = 5, l = 3$$

30. When an electron is added to a gaseous atom in its ground state to convert it into a negative ion, the enthalpy change accompanying the process is called the electron gain enthalpy ($\Delta_{eg}H$). It is a direct measure of the ease with which an atom attracts an electron to form anion.



The most stable state of an atom is the ground state. If an isolated gaseous atom is in excited state, comparatively lesser energy will be released on adding an electron. So, electron gain enthalpies of gaseous atoms must be determined in their ground states. Therefore, the terms ground state and isolated gaseous atom have been also included in the definition of electron gain enthalpy. Like ionisation enthalpy, electron gain enthalpy is measure either in electron volts per atom or kJ per mole. e.g. Electron affinity of chlorine is -348 kJ mol^{-1} .

- (a) Define Electron gain enthalpy. 1
(b) Define Ionisation enthalpy. 1
(c) Differentiate Electronegativity and electron gain enthalpy. 2

OR

- (c) Why is electron gain enthalpy of F less than Cl? 2

SECTION E

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

31. What is meant by hybridisation of atomic orbitals? Describe the shapes of sp, sp², sp³ hybrid orbitals. 5

OR

Discuss the shape of the following molecules using the VSEPR model:



32. (i) What would be the IUPAC name and the symbol of element Z=110? 5
(ii) Arrange the following :
(a) K Li Na (Increasing order of metallic character)
(b) Cl Br, F (Increasing order of nonmetallic character)
(iii) In terms of period and group where will you locate the element with Z=14?
(iv) What is a representative element?

OR

- (a) Use the periodic table to answer the following questions.
(i) Identify an element with two shells with 2 electrons in the outer subshell.
(ii) Identify an element that would tends to lose one electrons.

(iii) Identify an element that would tend to gain one electron.

(b) Assign the position of the element having outer electronic configuration:

(i) ns^2np^5 for $n=3$

(ii) $(n-1)d^1ns^2$ for $n=4$

33. What is a quantum number? Explain all four quantum numbers.

5

Or

(a) Write the electronic configuration of Cu(29).

(b) Write the electronic configuration of Na^+ .

(c) How many electrons will be present in the subshells having spin quantum number value of $-1/2$ for $n=3$?

(d) State Pauli's exclusion principle.

(e) State Hund's rule of maximum multiplicity.

*** Best of luck***