MANAVA BHARATI
INDIA INTERNATIONAL SCHOOL

CLASS XI: CHEMISTRY
MID TERM ASSESSMENT
SESSION:2024-25

Weightage: 60 marks.
Time Duration: 3 hours

General Instructions:

1. There are 30 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
3. SECTION B consists of 4 short answer questions carrying 2 marks each.
4. SECTION C consists of 6 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case - based questions carrying 4 marks each.
6. SECTION E consists of 2 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

SECTION A (1X16=16 Marks)

1. The number of moles present in 6 gms of carbon is: 1

(a) 2 (b) 0.5 (c) 5 (d) 1

2. *Total number of orbitals associated with the second shell will be...?* 1

(a) 2 (b) 9 (c) 4 (d) 3

3. *Which of the following has the minimum de Broglie wavelength given that all have equal velocity?*

(a) CO_2 molecule (b) NH_3 molecule (c) Electron (d) Proton

4. The atomic number of the element ununennium is: 1

(a) 102 (b) 109 (c) 119 (d) 108

5. The structure of XeF4 is 1

(a) Pentagonal bipyramidal (b) Square planar (c) Trigonal bipyramidal (d) Octahedral

6. Which of the following depend on temperature? 1

(a) % W/W (b) Molality (c) Molarity (d) None of these

7. The Vander Waal's radii of O, N, Cl, F and Ne increase in the order 1

(a) F, O, N, Ne, Cl
(b) N, O, F, Ne, Cl
(c) Ne, F, O, N, Cl
(d) F, Cl, O, N, Ne

8. B , A l , M g and K , what is the correct order of their metallic character. 1

(a) B < Al < Mg < K
(b) B < Mg < Al < K
(c) Mg < B < Al < K
(d) Mg < Al < B < K

9. Which of the following group of species are isoelectronic? 1

(a) O^{2-}, F^-, Na, Mg^{2+} (b) O^-, F^-, Na^+, Mg^+

(c) O^{2-}, F^-, Na^+, Mg^{2+} (d) O^{2-}, F^-, Na, Mg^{2+}

10. The shape of the ~~ammonia~~ CH_4 molecule is: 1

(a) Linear (b) Bent (c) Tetrahedral (d) Trigonal planar

11. Which is the best reducing agent? 1

(a) F^- (b) Cl^- (c) Br^- (d) I^-

12. The bond formed between two atoms with an electronegativity difference between 0.8 and 2.7 is classified as:

(a) Nonpolar covalent (b) Polar covalent

(c) Ionic (d) Metallic

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:**Chromium (Z=24) has the electronic configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^4$.

Reason: 4s has lower energy than 3d and is filled earlier than 3d.

14. **Assertion :** The bond order of helium is always zero.

Reason : The number of electrons in bonding molecular orbital and antibonding molecular orbital is equal.

15. **Assertion :** BF_3 molecule has zero dipole moment.

Reason : F is electronegative and B–F bonds are polar in nature.

16. **Assertion :** The number of oxygen atoms in 16 g of oxygen and 16 g of ozone is the same .

Reason : Each of the species represent 2 g atom of oxygen

SECTION B (2x 4 marks)

This section contains 4 questions. The following questions are very short answer type and carry 2 marks each

17. Carbon and oxygen combine to form two oxides- CO and CO_2. Which law does it prove? Give the statement of this law. 1+1

18. Yellow light emitted from a sodium lamp has a wavelength (λ) of 580 nm. Calculate the frequency (v) and wavenumber ($\bar{v}$) of the yellow light. 1+1

19. Using s,p,d notations, describe the orbital with the following quantum numbers:

n = 1, l = 0 (b) n = 3, l = 1 (c) n = 4, l = 2 (d) n = 4, l = 3 ½ x 4

20. Define electron gain enthalpy. What are its units? 1+1

SECTION C (3x 6 marks)

This section contains 5 questions. The following questions are short answer types and carry 3 marks each.

21. What is the difference between molality and molarity? (3 points each) 1½+ 1½

22. Give reason:

(i) The size of Cl^- ion is bigger than that of Cl atom whereas the size of Na^+ ion is smaller than that of Na.
(ii) Ionisation enthalpy of Mg is more than that of Na and Al. 1½+ 1½

23. Describe hybridisation in case of PCl_5. Why are the axial bond longer as compared to the equatorial bond ? 1½+ 1½

24. Among the elements Na, Mg, Al and Si,

(i) Which element has the highest ionisation energy among them?

(ii) Which element has the most metallic character?

Justify your answer in each case. 1½+ 1½

25. BCl_3 can be hydrolysed but CCl_4 not why ? Give proper explanation with shapes 3

26. Give reasons:-
(i) Water molecule has bent structure whereas carbon dioxide molecule is linear.
(ii) All the C - O bonds in carbonate ion are equal in length. 1½+ 1½

SECTION D (4x 2 marks)

The following questions are case -based questions. Read the passage carefully and answer the questions that follow.

27. *After having some idea about the terms atoms and molecules, One atomic mass unit is defined as a mass exactly equal to one-twelfth of the mass of one carbon – 12 atom. Molecular mass is the sum of atomic masses of the elements present in a molecule. The mole, symbol mol, is the SI unit of amount of substance. One mole contains exactly* 6.022×10^{23} *elementary entities.*

This number is the fixed numerical value of the Avogadro constant, N_A, when expressed in the unit mol^{-1} and is called the Avogadro number. The mass of a carbon–12 atom was determined by a mass spectrometer and found to be equal to 1.992648×10^{-23} g. Knowing that one mole of carbon weighs 12 g, the number of atoms in it is equal to 12g/moiC-12 / 1.992648×10^{23} g / C- 12 atom. = 6.0221367×10^{23} atoms/mol.

The mass of one mole of a substance in grams is called its molar mass. The molar mass in grams is numerically equal to atomic 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. Many a time, reactions are carried out with the amounts of reactants that are different from the amounts as required by a balanced chemical reaction.

1) One atomic mass unit (amu) is defined as a mass exactly equal to one-twelfth of the mass of one .....atom.

(a) Hydrogen -1 (b) Carbon -12 (c) Oxygen -12 (d) Chlorine -35

2) The mass of one mole of a substance in grams is called its.

(a) Atomic mass (b) Molecular Weight (c) Molecular mass (d) Molar mass.

3)The empirical formula of ethanoic acid is

(a) CHO (b) C_2HO_2 (c) CH_2O (d) CH_2O_2

4) Two moles contain exactly ...elementary entities.

(a) $6.02214076 \times 10^{21}$ (b) $6.02214076 \times 10^{22}$ (c) 12.044×10^{23} (d) 0.2214076×10^{24}

(1+1+1+1)

28. Atoms of eight elements A,B,C,D,E,F,G and H have the same number of electronic shells but different number of electrons in their outermost shell.It was found that elements A and G combine to form an ionic compound which can also be extracted from sea water.This compound is added in a small amount to almost to almost all vegetable dishes during cooking.Oxides of elements A and B are basic in nature while those of e and F are acidic.The oxide of D is almost neutral.Based on the above information, answer the following questions:

(i) To which group or period of the periodic table do the listed elements belong?

(ii) What would be the nature of compounds formed by a combination of elements B and F?

(iii) Which two of these elements could definitely be metals and which are likely to be non- metals?

(iv) Which one of the eight elements is most likely to be found in gaseous state at room temperature?

OR

(iv) If the number of electrons in the outermost shell of elements C and G be 3 and 7 respectively,write the formula of the compound formed by the combination of C and G.. (1+1+1+1)

SECTION E (5x 2 marks)

The following questions are long answer types and carry 5 marks each. One question has an internal choice.

29. (a) A vessel contains 1.6 g of dioxygen 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. Calculate

(i) volume of the new vessel. (ii) number of molecules of dioxygen.

(b) Nickel atoms can lose two electrons to form Ni^{2+} ions. The atomic number of nickel is 28. From which orbital nickel will lose two electrons and why ? (2+2+1)

30.(a) Define Hybridisation. Describe hybridisation in the case of SF_6.

(b) Find the bond order and compare the relative stability and magnetic nature of O_2 & N_2 on the basis of MOT. (2+3)

OR

30. (a) Draw the resonating structure of

(i) Ozone molecule

(ii) Nitrate ion

(b) Give reasons for the following:

(i) Covalent bonds are directional bonds while ionic bonds are non- directional.

(ii) Water molecules have a bent structure whereas carbon dioxide molecules are linear.

(iii) Ethyne molecules are linear. (2+3)