



# ST.MARGARET SR.SEC. SCHOOL

## MID TERM EXAMINATION 2023-24

CHEMISTRY – XI

SAMPLE PAPER

M.M: 70

Time: 3Hours

### 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 very 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. **SECTION -A**

1. The number of significant figures in 23800 is

- (a) 1 (c) 3  
(b) 4 (d) 5 (1)

2. The total number of electrons in orbitals in a shell with principal quantum number n is

- (a) 2n (c)  $n^2$   
(b)  $2n^2$  (d)  $n^3$  (1)

3. Which of the following options does not represent the correct electronic configuration of an atom?

- (a)  $1s^2 2s^2 2p^6 3s^2$  (c)  $1s^2 2s^2 2p^6 3s^1 3p^6$   
(b)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$  (d)  $1s^2 2s^2 2p^6 3s^2 3p^6$  (1)

4. Number of angular nodes for 4p orbital is \_\_\_\_\_.

- (a) 4 (c) 3  
(b) 2 (d) 1  
(1)

5.The element with highly negative electron gain enthalpy is

- (a) Alkali metals (c) Halogens  
(b) Carbon (d) noble gases  
(1)

6.The most electronegative atom in the following is

- (a) N (c) C  
 (b) O (d) F (1)

7. The general electronic configuration of p-block elements is

- (a)  $(n - 1)p^{1 \text{ to } 10} ns^2$  (c)  $np^6 ns^{0 - 2}$   
 (b)  $ns^{1 - 2} np^6$  (d)  $ns^2 np^6$  (1)

8. Which of the following molecule is trigonal bipyramidal?

- (a)  $PCl_5$  (c)  $CH_4$   
 (b)  $BF_3$  (d)  $AlF_3$  (1)

9. Predict the correct order

- (a)  $bp - bp > lp - bp > lp - bp$  (c)  $lp - bp > bp - bp > lp - lp$   
 (b)  $lp - lp > lp - bp > bp - bp$  (d)  $lp - lp > bp - bp > lp - bp$  (1)

10. The species which has two lone pairs of electrons

- (a)  $ClF_3$  (c)  $NCl_3$   
 (b)  $BCl_3$  (d)  $PH_3$  (1)

11. The number of significant figures in 2.303 is

- a) 2 (c) 1  
 b) infinite (d) 4 (1)

12. 1 Angstrom is equal to

- c)  $10^{-12}m$  (c)  $10^{-9}m$   
 d)  $10^{-10}m$  (d)  $10^{-5}m$  (1)

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

- (a) Assertion and reason both are correct and reason is correct explanation of assertion.  
 (b) Assertion and reason both are wrong statements.  
 (c) Assertion is correct but reason is wrong statement.  
 (d) Assertion is wrong but reason is correct statement.  
 (e) Assertion and reason both are correct statements but reason is not correct explanation of assertion.

13. **Assertion** : It is possible to determine the exact position and exact momentum of an electron simultaneously.

**Reason** : The path of an electron in an atom is not clearly defined.

14. **Assertion** : Smaller the size of an atom greater is the electronegativity.

**Reason** : Electronegativity refers to the tendency of atom to share the electrons.

15. **Assertion** : Second ionization enthalpy will be higher than the first ionization enthalpy.

**Reason** : Ionization enthalpy is a quantitative measure of the tendency of an element to gain electron.

16. **Assertion** : The bond order of  $Ne_2$  is always zero.

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

### SECTION-B

17. A compound contains 4.07% hydrogen, 24.27% carbon and 71.65% chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulae? (2)

18 Define molarity and molality. (2)

19. A 100-watt bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb. (2)

20. An atom of an element contains 18 electrons and 6 neutrons. Deduce (i) number of protons.

(ii) electronic configuration of the element.

(iii) number of paired electrons.

(iv) number of unpaired electrons. (2)

21, Among the elements of the third period Na to Ar, pick out the element:

(i) with highest first ionisation enthalpy

(ii) with largest atomic radius

(iii) which is most reactive non-metal

(iv) which is most reactive metal. (2)

### SECTION-C

22. Explain the following observations:

(i)  $\text{CO}_2$  and  $\text{SO}_2$  are not isostructural.

(ii)  $\text{BF}_3$  and  $\text{NF}_3$  are not isostructural. (3)

23. Give correct reason for the following:

(i)  $\text{BeF}_2$  has a zero dipole moment although the Be—F bonds are polar.

(ii) All carbon to oxygen bonds in  $\text{O}_3$  are equivalent. (3)

24. Which of the compounds in pair of compounds has higher dipole moment?

(i)  $\text{BCl}_3$  and  $\text{BF}_3$ ,

(ii)  $\text{SO}_2$  and  $\text{SO}_3$ ,

(iii)  $\text{H}_2\text{O}$  and  $\text{H}_2\text{S}$  (3)

25. (i) What is limiting reactant?

(ii) Oxygen is prepared by catalytic decomposition of potassium chlorate ( $\text{KClO}_3$ ).

Decomposition of potassium chlorate gives potassium chloride ( $\text{KCl}$ ) and oxygen ( $\text{O}_2$ ).

If 2.4 mol of oxygen is needed for an experiment, how many grams of potassium chlorate must be decomposed?

(At. mass of K = 39, Cl=35.5, O = 16) (3)

26. Give the reasons for the following:

(i) Noble gases have positive electron gain enthalpy..

(ii) Anionic radius is always more than that of neutral atom.

(iii) Ionization enthalpy of Be is more than that of Li. (3)

27.(i) The energy associated with the first orbit in the hydrogen atom is  $-2.18 \times 10^{-18}$  J/atom. What is the energy associated with the second orbit?

(ii) Calculate the radius of Bohr's fifth orbit for  $\text{Li}^{2+}$  atom. (3)

28. i) Which out of  $\text{CH}_4$  and  $\text{CH}_3\text{Cl}$  has higher dipole moment and why?

(ii) Draw the shape of  $\text{NH}_3$  and  $\text{XeO}_3$  according to VSEPR theory. (3)

#### SECTION-D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each.

29. A number of molecules and polyatomic ions cannot be described accurately by a single Lewis structure and a number of descriptions (representations) based on the same skeletal structure are written and these taken together represent the molecule or ion. This is a very important and extremely useful concept called resonance. The contributing structures or canonical forms taken together constitute the resonance hybrid which represents the molecule or ion. Hydrogen bond is formed when a hydrogen atom finds itself between two highly electronegative atoms such as F, O and N. Hydrogen bonds have a powerful effect on the structure and properties of many compounds.

*Answer the following questions:*

a) Define hydrogen bonding ?

b) Which type of hydrogen bonding occurs in o-nitrophenol ?

c) Draw Lewis dot structure of i)  $\text{CO}_2$                       ii) NO (4)

30. Chemical reactivity is highest at the two extremes of a period and is lowest in the centre. The reactivity on the left extreme of a period is because of the ease of electron loss (or low ionization enthalpy). Highly reactive elements do not occur in nature in free state; they usually occur in the combined form. Oxides formed of the elements on the left are basic and of the elements on the right are acidic in nature. Oxides of elements in the centre are amphoteric or neutral.

Answer the following questions :

a) Define electronegativity. ?

b) How atomic size varies across the period?

c) Predict the group and period number of the following elements :

a) X (Atomic no.- 29)    b) Y (Atomic no.- 17) (4)

#### SECTION-E

31. Arrange the following elements in increasing order of metallic character: B, Al, Mg and K.

(i) Identify an element with five electrons in the outer subshell.

(ii) Identify an element that would tend to lose two electrons.

(iii) Identify an element that would tend to gain two electrons.

(iv) Identify the group having metal, non-metal, liquid as well as gas at the room temperature. (5)

32.I) Calculate the wave number for the shortest wavelength transition in the Balmer series of atomic hydrogen

( $R_H = 1.09677 \times 10^7 \text{ m}^{-1}$ ).

II) State a) Hund's rule                      b) Bohr's Bury rule                      (3+2)

33. (i) Write the molecular orbital diagram of  $C_2$ . Calculate its bond order and predict its magnetic behaviour. (ii) Write the hybridisation and shape of the following on the basis of VSEPR theory :

a)  $XeF_4$

b)  $H_2O$

(3+2)

