ST.MARGARET SR.SEC. SCHOOL

MID TERM EXAMINATION 2024-25

CHEMISTRY – XI

Time: 3Hours   **SAMPLE PAPER**   **M.M: 70**

General Instructions:

Read the following instructions carefully.

a) There are **33** questions in this question paper with internal choice.

b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.

c) SECTION B consists of 5 very short answer questions carrying 2 marks each.

d) SECTION C consists of 7 short answer questions carrying 3 marks each.

e) SECTION D consists of 2 case- based questions carrying 4 marks each.

f) SECTION E consists of 3 long answer questions carrying 5 marks each. **SECTION -A**

1. The number of atoms present in one mole of an element is equal to Avogadro number. Which of the following element contains the greatest number of atoms?

   (a) 4 g He   (b) 46 g Na

   (c) 0.40 g Ca   (d) 12 g He   (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. Name of subshell is p when l is equal to _____.

   (a) 4   (c) 3

   (b) 2   (d)1   (1)

   5. Considering the elements B, Al, Mg, and K, the correct order of their metallic character is:

   (a) B > Al > Mg > K   (b) Al > Mg > B > K

   (c) Mg > Al > K > B   (d) K > Mg > Al > B   (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^2np^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) BCl3   (d) PH3   (1)

11. The value of 'h' = 6.63×10^{-34} Js. The speed of light is 3×10^{17} nm s^{-1}. Which value is closer to the wavelength in nanometer of a quantum of light with frequency 6×1015 s^{-1}.
(a) 50   (b) 75   (c) 10   (d) 25   (1)

12.1Angstrom is equal to

a) 10^{-12}m   (c)10^{-9}m
b) 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 (A):** An orbital cannot have more than 2 electrons with opposite spin.

Reason (R): No two electrons can have same set of all the four quantum numbers same.

SECTION-B

17. The electron energy in hydrogen atom is given by $E_n = (-2.18 \times 10^{-18})/ n^2$ joules. Calculate the energy required to remove an electron completely from the $n = 2$ orbit. What is the longest wavelength (in Å) of light that can be used to cause this transn (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) CO_2 and SO_2 are not isostructural.
(ii) BF_3 and NF_3 are not isostructural.   (3)

23.Give correct reason for the following:
(i) BeF_2 has a zero dipole moment although the Be—F bonds are polar.
(ii) All carbon to oxygen bonds in O_3 are equivalent.   (3)

24. Which of the compounds in pair of compounds has higher dipole moment?
(i) BCl_3 and BF_3,
(ii) SO_2 and SO_3,
(iii) H_2O and H_2S (3)

25. (i) What is limiting reactant?
(ii) Oxygen is prepared by catalytic decomposition of potassium chlorate ($KClO_3$).
Decomposition of potassium chlorate gives potassium chloride (KCl) and oxygen (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 -2.18×10^{-18} J/atom. What is the energy associated with the second orbit?

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

28. i) Which out of CH_4 and CH_3Cl has higher dipole moment and why?

(ii) Draw the shape of NH_3 and 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) How does electronegativity varies along a period and why?

(b) Why does K and Rb have same electronegativity although Rb is bigger than K?

(c) (i) Why does electronegativity decrease down the group?

(ii) Why is CsF most ionic?

Or

(c) (i) Why is H^- ion bigger than F^- ion?

(ii) Why is LiI covalent? (4)

30. According to de Broglie, matter should exhibit dual behaviour, that is both particle and wave like properties. However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a bowler at a speed of 100 km/h.
    i)Calculate the wavelength of the ball and explain why it does not show wave nature.
ii)Table-tennis ball has a mass 10 g and a speed of 90 m/s. If speed can be measured within an accuracy of 4%, what will be the uncertainty in speed and position. (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)

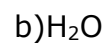32.I)Calculate the wave number for the shortest wavelength transition in the Balmer series of atomic hydrogen

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

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

33. (i) Write the molecular orbital diagram of F_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)