INDIAN SCHOOL SOHAR
TERM I EXAMINATION (2019 – 20)
CHEMISTRY

CLASS : XI **MAX. MARKS : 70**

DATE : 19.09.2019 **DURATION : 3.00 HRS**

General Instructions:

(a) All questions are compulsory.

(b) Section A: Question numbers 1 to 20 very short answer questions carrying 1 mark each.

(c) Section B: Question numbers 21 to 27 are short answer questions carrying 2 marks each.

(d) Section C: Question numbers 28 to 34 are also short answer questions carrying 3 marks each.

(e) Section D: Question numbers 35 and 37 are long answer questions carrying 5 marks each.

(f) There is no overall choice. However an internal choice has been provided in two questions of one mark, two questions of two marks, two questions of three marks and all the three questions of five marks weightage. You have to attempt only one of the choices in such questions.

(g) Use log tables, if necessary, Use of calculator is not allowed.

SECTION A

I. Choose the correct answer:

1. The solution of A and B are 0.1 and 0.2 molar in a substance. If 100 mL of 'A' are mixed with 25 mL of B and there is no change in volume, then the final molarity of solution is
   (a) 0.15 M (b) 0.18 M (c) 0.12 M (d) 0.30 M
2. The mass of one mole a chloride formed by metal 'X' is 110.0g. Which one could be formula of chloride?
   (a) XCl (b) XCl_2 (c) XCl_3 (d) XCl_4
3. The de Broglie wavelengths associated with a ball of mass 1 kg having kinetic energy 0.5 J is
   (a) 6.626×10^{-34}m (c) 13.20×10^{-34}m
   (b) 10.38×10^{-21} m (d) 6.626×10^{-34} A^0

   OR

   Which of the following pairs of d-orbitals have electron density along the axis?
   (a) d_{z^2}, d_{xz} (b) d_{xz}, d_{yz} (c) $d_{z^2}, d_{x^2-y^2}$ (d) $d_{zy}, d_{x^2y^2}$
4. In which of the following pairs, the ions are isoelectronic?
   (a) Na^+, Mg^{2+} (b) Al^{3+}, O^- (c) Na^+, O^{2-} (d) N^{3-}, Cl^-
5. Which elements is expected to have lowest ionisation enthalpy?
   (a) Sr (b) As (c) Xe (d) S
6. Which of the following is an electron deficient molecule?
   (a) C_2H_6 (b) B_2H_6 (c) SiH_4 (d) PH_3
7. Which of the following pair consist of only paramagnetic species?
   (a) O_2, NO (b) O_2^+, O_2^{2-} (c) CO, NO (d) O_2^{2-}, N_2^-
8. By what factor does the average velocity of a gaseous molecules increase when the temperature is doubled?
   (a) 2 (b) 2.8 (c) 4.0 (d) 1.4
9. Maximum deviation from ideal gas is expected from

(a) CH_4 (b) NH_3 (c) H_2 (d) N_2

10. Which of the following solution is strongest oxidising agent?
    (a) MnO_4^- in acidic medium (c) MnO_4^- in basic medium
    (b) MnO_2 in basic medium (d) CrO_4^{2-} in basic medium

II. 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 statements and reason is correct explanation for assertion.
(b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
(c) Assertion is correct statement but reason is wrong statement.
(d) Assertion and reason both are incorrect statements.

11. **Assertion** : In the reaction between potassium permanganate and potassium iodide, permanganate ions act as oxidising agent.
    Reason : Oxidation state of manganese changes from +2 to +7 during the reaction.
12. **Assertion** : It is impossible to determine the exact momentum of an electron simultaneously.
    Reason : The path of an electron in an atom is clearly defined.
13. **Assertion** : Electron gain enthalpy becomes less negative as we go down a group.
    Reason : Size of the atom increases on going down the group and the added electron would be farther from the nucleus.

III. Fill in the blanks:

14. Electron jumps from n=5 to n=2 belongs _____ series of hydrogen spectrum.
15. Anode is called _____ electrode, cathode is called _____ electrode.

IV. Answer the following in one or two sentences:

16. What are the functional groups of aldehydes and nitro compounds.
17. Write the structure of 3,4,4,5-tetramethylheptane.

OR

Give bond line structure of octa-1,5-diene.

18. How is density of gas related to its molar mass?
19. AlF_3 or $AlCl_3$, Which is more covalent?
20. What is limiting reactant in a reaction?

SECTION B

21. Molarity of a sample of dilute sulphuric acid is 0.5 M and density is 1.02 g cm^{-3}. What is mole fraction of H_2SO_4? [Molar mass of H_2SO_4 = 98 $gmol^{-1}$]
22. Boron occurs in nature in the form of two isotopes, $^{11}_{5}B$ and $^{10}_{5}B$, in ratio of 81% and 19% respectively, calculate its average atomic mass.

OR

Vitamin C is known to contain 1.29 x 10^{24} hydrogen atoms. Calculate the number of moles of hydrogen atoms.

23. Define an orbital. What does angular quantum number tell about an orbital.

OR

(a) How many subshells are associated with n=5?

(b) Write the electronic configuration of Fe^{2+} ions (z=26).

24. The reducing power of elements increases down the group but reverse is true for elements along the period, Why?

25. Arrange in increasing order of

(a) Atomic size I, F, Cl, Br.

(b) Oxidising power I, F, Cl, Br.

26. Dichromate ion in acidic medium reacts with ferrous ion to give ferric and chromic ions. Write the balanced chemical equation corresponding to the reaction.

27. Find the oxidation number of carbon in following compounds:
CH_3OH, CH_2O, HCOOH, C_2H_2

SECTION C

28. (a) What is the oxidation number of 'S' in H_2SO_5?

(b) Balance the following equation: $Zn(s) + NO_3^-(aq) \rightarrow Zn^{2+}(aq) + NH_4^+(aq) + H^+$

29. Explain the following:

(i) Boyle's law.

(ii) Avogadro's law

(iii) Critical temperature

OR

A gas at a pressure of 5 atm is heated from 0^0C to 546^0C and is simultaneously compressed to one third of original volume. Find the final pressure.

30. (a) A gaseous mixture contains 2.2 bar He, 1.1 bar H_2 and 4.2 bar N_2. What is mole fraction of N_2?

(b) Which has higher viscosity ether or water? Why?

31. Write the molecular electronic configurations of the following species:

(i) N_2 (ii) N_2^+ (iii) N_2^- (iv) N_2^{2-}

(a) Calculate their bond orders.

(b) Predict their magnetic behaviour.

(c) Which of these shows highest para-magnetism?

OR

(a) Explain, Why Be_2 molecule does not exist by using molecular orbital theory.

(b) Describe the state of hybridisation in PCl_5. Why are the axial bonds longer as compared to equatorial bonds?

32. Give reason for the following:

(i) Electron gain enthalpy of fluorine is less negative than that of chlorine.

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

(ii) Ionization enthalpy of nitrogen is more than that of oxygen.

33. When electromagnetic radiation of wavelength 300 nm falls on the surface of sodium, electrons are emitted with kinetic energy of 1.68×10^5 $Jmol^{-1}$. What is the minimum energy needed to remove an electron from sodium? What is the maximum wavelength that will cause a photo-electron to be emitted? ($h=6.626 \times 10^{-34}$ Js)

34. A compound on analysis found to contain following percentage composition: Na =43.4%, C=11.4% and O=45.3%. Determine the empirical and molecular formulae. Given the relative molecular mass of the compound is 106. (Atomic masses of Na, C and O are 23, 12 and 16 respectively).

SECTION D

35. (a) Show that the circumference of Bohr's orbit for the H-atom is an integral multiple of the de-Broglie wavelength of electron revolving around the orbit.

(b) Explain that the effect of the Heisenberg uncertainty principle is significant only for motion of microscopic objects and is negligible for that of macroscopic objects. (h=6.626 x 10^{-34} Js, Mass of electron = 9.1 x 10^{-31} kg)

(c) State Hund's Rule of maximum multiplicity.

OR

(a) The energy associated with Bohr's first orbit is -2.18 x 10^{-18} Jatom^{-1}. What is the energy associated with fifth orbit?

(b) The work function for Caesium atom is 1.9 eV. Calculate the threshold wavelength. [Given : 1eV = 1.6 x 10^{-19} J]

(c) How many subshells are associated with n=4?

36. (a) Why is HF liquid but HCl, HBr, HI are gases?

(b) Why is o-nitrophenol steam volatile whereas p-nitrophenol is not steam volatile?

(c) (i) Arrange the following in decreasing order of their bond angle: H_2O, NH_3, H_2S

(ii) Sketch the bond moments and resultant dipole moment of the following molecule: H_2O, NH_3, NF_3 and PCl_3

(iii) Draw shape of the following molecules on the basis of VSEPR theory: XeF_4 and SF_4. (Atomic Number of Xe and S are 54 and 16 respectively)

OR

(a) What are two conditions for the formation of hydrogen bond?

(b) In which of the following compounds 'S' does not obey octet rule? SF_2, SF_4, SF_6, SO_2

(c) Explain the term hybridisation taking CH≡CH as an example.

37. (a) A gas occupies a volume of 4 L at 8 x 10^5 Nm^{-2}. Calculate the additional pressure required to decrease the volume of the gas to 2.5 L, keeping the temperature constant.

(b) Which of the following gas will have smaller value of van der Waals' constant 'a'? Ne or NH_3

(c) The size of a weather balloon changes as it rises. What change is expected in its size and why?

OR

(a) A vessel of 1.00 dm^3 capacity contains 16.00g of oxygen and 8.00g of hydrogen at 17^{0}C. Calculate the partial pressure of each gas and also the total pressure in the container (R = 0.083 bar dm^{3}K^{-1}mol^{-1})

(b) According to kinetic molecular theory, explain why gases exert pressure?

(c) How is isotherm at critical temperature of a gas different from those at lower temperatures?