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| **HY/CHQP/1123/B 06-NOV-2023** | | | | |
| **HALF YEARLY EXAMINATION (2023-24)** | | | | |
| **Subject: CHEMISTRY**  **Grade: XI** | | **Max. Marks:70**  **Time: 3Hrs** | | |
| **Name:** | | | **Section:** | **Roll No:** |
| ***General Instructions:***  Read the following instructions carefully.  1. There are 33 questions in this question paper.  2. SECTION A - Q. No. 1 to 16 are multiple choice questions carrying 1 mark each.  3. SECTION B - Q. No. 17 to 21 are short answer questions carrying 2 marks each.  4. SECTION C- Q. No. 22 to 28 are short answer questions carrying 3 marks each.  5. SECTION D- Q. No. 29 to 30 are case study questions carrying 4 marks each.  5. SECTION E- Q. No. 31 to 33 are long answer questions carrying 5 marks each.  6. All questions are compulsory.  7. Use of calculator is not allowed | | | | |
|  | **SECTION A** | | | |
| 1 | In an aqueous solution of glucose, χ glucose = 0.1, χ H2O is equal to \_\_\_\_?   1. 0.1 2. 0.05 3. 0.9 4. 0.45 | | | | 1 |
| 2 | Which of the following options does not represent ground state electronic configuration of an atom?   1. 1s2 2s2 2p6 3s2 3p6 3d8 4s2 2. 1s2 2s2 2p6 3s2 3p6 3d9 4s2 3. 1s2 2s2 2p6 3s2 3p6 3d10 4s1 4. 1s2 2s2 2p6 3s2 3p6 3d5 4s1 | | | | 1 |
| 3 | Which of the following elements does not show disproportionation tendency?   1. Cl 2. Br 3. F 4. I | | | | 1 |
| 4 | The outer electronic configuration of an element that belongs to d-block will be:   1. 3s2 3p4 2. 3s2 3p6 4s2 3. 3d10 4s2 4. 6s2 4f3 | | | | 1 |
| 5 | Which of the following is an electron deficient molecule?   1. C2H6 2. AlCl3 3. SiH4 4. PH3 | | | | 1 |
| 6 | Which of the following represents largest number of particles?   1. Atoms in 1 mole of CH4 2. Atoms in 0.5 mole of SO3 3. Atoms in 0.5 mole of CO2 4. Atoms in 1 mole of CO | | | | 1 |
| 7 | The correct order for chemical reactivity in terms of oxidizing property is:   1. F > Cl > O > N 2. F > O > Cl > N 3. Cl > F > O > N 4. O > F > N > Cl | | | | 1 |
| 8 | The reduction half reaction for the reaction Fe2+ (aq) + Cr2O72- (aq) → Fe3+ (aq) + Cr3+ (aq)   1. Fe3+ (aq) → Fe2+ (aq) 2. Cr2O72- (aq) → Cr3+ (aq) 3. Cr3+ (aq) → Cr2O72- (aq) 4. Fe2+ (aq) → Fe3+ (aq) | | | | 1 |
| 9 | The number of angular nodes for 4d orbital is \_\_\_\_\_\_.   1. 4 2. 3 3. 2 4. 1 | | | | 1 |
| 10 | Which of the following molecules has maximum bond angle?   1. NH3 2. CH4 3. H2O 4. CO2 | | | | 1 |
| 11 | 16 g of oxygen has same number of molecules as in:   1. 16 g of CO 2. 28 g of N2 3. 14 g of N2 4. 2.0 g of H2 | | | | 1 |
| 12 | Which of the following should be possible subshells for *n + l* = 7 ?   1. 7s, 6p, 5d, 4f 2. 4f, 5d, 6p, 7s 3. 7s, 6p, 5d, 6d 4. 4s, 5d, 6p, 7s | | | | 1 |
| 13 | The size of isoelectronic species F-, Ne and Na+ is affected by:   1. Nuclear charge (Z) 2. Valence principal quantum number (n) 3. Electron-electron interaction in the outer orbitals   None of the factors because their size is the same. | | | | 1 |
| 14 | The value of *‘h’* = 6.63 x 10-34 Js. The speed of light is 3 x 1017 nm s-1. Which value is closer to the wavelength in nanometer of a quantum of light with frequency 6 x 1015 s-1 ?   1. 50 2. 75 3. 10 4. 25 | | | | 1 |
|  | Choose the correct answer out of the following choices:  (i) Assertion and Reason both are correct statements, and Reason is correct explanation of Assertion.  (ii) Assertion and Reason both are correct statements, but Reason is not the correct explanation of Assertion.  (iii) Assertion is correct statement, but Reason is wrong statement.  (iv) Assertion is wrong statement, but Reason is correct statement. | | | |  |
| 15 | Assertion: Ionic compounds usually have high melting and boiling points.  Reason: A large amount of energy is needed to overcome the strong interionic electrostatic attractive forces. | | | | 1 |
| 16 | Assertion: In the reaction between potassium permanganate and potassium iodide, permanganate ions act as oxidizing agent.  Reason: Oxidation state of manganese changes from +2 to +7. | | | | 1 |
|  | **SECTION B** | | | |  |
| 17 | Assuming fully decomposed, the volume of CO2 released at STP on heating 9.85g of BaCO3 [At. Mass of Ba = 137] will be: | | | | 2 |
| 18 | 1. How many unpaired electrons are present in Cr2+? 2. Write the atomic number of the element in which filling of 3d subshell in the atom just starts. | | | | 2 |
| 19 | A hydrocarbon was found to contain 75% by mass of carbon and 25% by mass of hydrogen. What is the empirical formula of the compound? | | | | 2 |
| 20 | Give reason:   1. Chlorine (Cl) has more negative electron gain enthalpy than fluorine (F). 2. Lithium shows diagonal relationship with magnesium. | | | | 2 |
| 21 | Account for the following:   1. H2O(s) + F2(g) → HF(g) + HOF(g) is a redox reaction. 2. ClO4- does not show disproportionation. | | | | 2 |
|  | **SECTION C** | | | |  |
| 22 | 1. Calculate the molality of the solute in an aqueous solution containing 3.0g of urea (NH2CONH2) per 250g of water. 2. Why is molality considered a better measurement than molarity? | | | | 3 |
| 23 | Write the overall net ionic equation for the following: Chloride ion is oxidized to Cl2 by MnO4- (basic medium) | | | | 3 |
| 24 | The kinetic energy of an electron is 5×10-5 eV. What is the wavelength of the de Broglie wave associated with it? (1eV = 1.602 x 10-19J) | | | | 3 |
| 25 | 1. What is limiting reagent? 2. A mixture containing 100g of H2 and 100g of O2 is ignited to form water. Identify the limiting reagent and calculate the amount of water formed. | | | | 3 |
| 26 | What are the frequency and wavelength of a photon during a transition from n = 5 state to n = 2 state in the He+ ion? | | | | 3 |
| 27 | The IE1 and IE2 values (KJ/mole) of a few elements designated by A, B, C, D are shown below:   |  |  |  | | --- | --- | --- | | Element | IE1 | IE2 | | A | 2372 | 5251 | | B | 520 | 7300 | | C | 900 | 1760 | | D | 1680 | 3380 |   Which of the above element is likely to be,  a) a reactive metal  b) a reactive non-metal  c) a noble gas | | | | 3 |
| 28 | Explain based on VSEPR theory:   1. Water molecule has bent structure whereas CO2 is linear. 2. The bond angles in PF5 are 90° and 120° while all bond angles in PF6- are 90° 3. Draw the shape of SF4 | | | | 3 |
|  | **SECTION D** | | | |  |
| 29 | Read the following passage and answer the questions that follow:  Bohr’s model explained electrons can revolve only in certain permitted orbits whose angular momentum is integral multiple of h/2π, associated with fixed amounts of energy. Bohr theory could successfully explain stability of atoms and spectrum of unielectron species. Hydrogen spectrum consist of Lyman, Balmer, Paschen, Brackett and Pfund series. Bohr’s theory could not explain spectrum of multi-electron species, Stark effect, Zeeman effect, dual nature of matter, de Broglie equation and Heisenberg uncertainty principle which lead to orbital concept. Electrons were filled in orbitals according to Aufbau’s principle, Hund’s rule and Pauli’s exclusion principle. Each electron is identified by four quantum numbers *n, l, ml* and *ms* of which *n, l, ml* were derived from Schrodinger’s wave equation. Half filled and completely filled orbitals are more stable due to exchange energy and symmetrical distribution of electrons.   1. Heat treatment of muscular pain involves radiation of wavelength 900 nm. Which spectral line of H-atom is suitable for this purpose? 2. What rules out the probability of existence of definite path of electrons? 3. State de Broglie equation. 4. State Pauli exclusion principle. | | | | 4 |
| 30 | Read the following passage and answer the questions that follow:  The attractive force which holds the two atoms together is called chemical bond. Covalent bond is formed by equal sharing of electrons. Coordinate bond is formed by unequal sharing of electrons. Ionic bond is formed by transfer of electrons from one atom to another. Octet rule, although very useful but it is not universally applicable. According to valence bond theory, covalent bond is formed by overlapping of half filled atomic orbitals resulting in lowering of energy and more stability. Bond order is the number of bonds between atoms in a molecule. Higher the bond order, more will be stability and bond dissociation enthalpy but smaller bond length. Polarity of covalent bond depends upon difference in electronegativity. Covalent character of bond depends upon polarizing power, smaller cation and bigger anions have higher polarizing power. VSEPR theory helps to predict shapes of molecules.   1. Which of the following is correct structure of N2O?      1. CsI3 consist of 2. Cs+ and I- 3. Cs+ and I3- 4. Cs+ and I2- 5. None of these 6. The correct order of covalent character in the following compounds is: 7. RbCl > KCl > NaCl > LiCl 8. LiCl > NaCl > KCl > RbCl 9. LiCl < NaCl > KCl < RbCl 10. LiCl > NaCl < KCl >.RbCl 11. Which of the following has maximum repulsion? [lp is lone pair, bp is bond pair] 12. lp – bp 13. bp – bp 14. lp – lp 15. All of these have equal | | | | 4 |
|  | **SECTION E** | | | |  |
| 31 | 1. A compound on analysis found to contain following percentage composition: Na = 43.4%, C = 11.3% and O = 45.3%. Determine the empirical and molecular formulae. Given: the relative molecular mass of the compound is 106. (Atomic mass of Na = 23u) 2. Calculate the mass of ferric oxide that will be obtained by complete oxidation of 2g of Fe. (Atomic weights of Fe = 56 u, O = 16 u).   **OR**  (a) Two bottles of A and B contain 1M and 1m aqueous solutions (d=1g/ml) of sulphuric acid respectively. Which one is more concentrated and why?  (b) Commercially available concentrated HCl contains 38% HCl by mass.  (i) What is the molarity of the solution if its density is 1.19gcm-3?  (ii) What volume of concentrated HCl is needed to make 1.0L of 0.1M HCl solution?  (c) How many moles of Ca(NO3)2 are there in a 75mL sample of a 0.25M solution of Ca(NO3)2? | | | | 5 |
| 32 | Answer the following:   1. *n + l* value for 14th electron in an atom. 2. Increasing order of filling electron in 4f, 5p and 6d subshells. 3. *‘m’* and *‘l’* value for last electron of Mg atom (Atomic no. = 12). 4. Subshell in which last electron is present in Ga (Atomic no. = 31). 5. Sum of spin of all electrons in element having atomic number 14.   **OR**  a) State Heisenberg’s Uncertainty Principle.  b) Which of the two, an electron or a neutron will show more accuracy in its position, if there is an equal uncertainty in their velocities? [ mass of electron = 9.1 × 10 – 31 Kg; mass of proton = 1.67 × 10 – 27 Kg]  c) Calculate the uncertainty in the velocity of wagon of mass 2000 kg whose position is known to an accuracy of + 10m. | | | | 5 |
| 33 | Account for the following (Attempt any 5)   1. The dipole moment of CH3F is greater than that of CH3Cl. 2. LiCl is more covalent than NaCl. 3. Benzene ring has alternate single and double bonds, yet all the C-C bonds are of equal lengths. 4. The carbonate ion more stable than H2CO3. 5. CO2 has zero dipole moment although carbon – oxygen bonds are polar. 6. Water molecule has bent structure whereas CO2 is linear. | | | | 5 |

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