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| **HALF-YEARLY EXAM (2022-23)Answer key** | | | | | |
| **Subject: CHEMISTRY**  **Grade: XI** | | **Max. Marks:70**  **Time: 3Hrs** | | | |
| **Name:** | | | **Section:** | **Roll No:** | |
| ***General Instructions:***   * GENERAL INSTRUCTIONS: Read the following instructions carefully.   1. There are 37 questions in this question paper.  2. SECTION A - Q. No. 1 to 10 are multiple choice questions carrying 1 mark each.  3. SECTION B - Q. No. 11 to 20 are very short answer questions carrying 1 mark each.  4. SECTION C- Q. No. 21 to 27 are short answer questions carrying 2 marks each.  5. SECTION D- Q. No. 28 to 34 are short answer questions carrying 3 marks each.  5. SECTION E- Q. No. 35 to 37 are long answer questions carrying 5 marks.  6. All questions are compulsory.  7. Use of calculators is not allowed | | | | | |
|  | **SECTION A** | | | | |
| 1 | d) 12g He | | | | 1 |
| 2 | b) Alpha particle (He2+) | | | | 1 |
| 3 | d) H3O+ | | | | 1 |
| 4 | b) NH4NO3 | | | | 1 |
| 5 | a) 6.022 × 1023 molecules of oxygen | | | | 1 |
| 6 | a) SO2 and SO3 | | | | 1 |
| 7 | c) O22– | | | | 1 |
| 8 | a) FeCl3 acts as an oxidizing agent | | | | 1 |
| 9 | c) 0.025 mol L–1 | | | | 1 |
| 10 | b) O2– < O2 < O2+ | | | | 1 |
|  | **SECTION B** | | | |  |
| 11 |  | | | | 1 |
| 12 | 1. Oxygen in CaO2 is -1   b)Manganese in MnO4 2- is +6 | | | | 1 |
| 13 | Due to resonance | | | | 1 |
| 14 | d<p< s | | | | 1 |
| 15 | CH2O | | | | 1 |
| 16 | The minimum frequency below which electrons are not ejected is called threshold frequency. | | | | 1 |
| 17 | Arsenic is oxidized and chlorine is reduced | | | | 1 |
| 18 | 6.022 × 1022 molecules. | | | | 1 |
| 19 | In HNO3, the oxidation state of nitrogen is maximum (+5) and can be reduced only and hence acts as an oxidizing. In HNO2, the oxidation state of nitrogen is +3. hence it can act as an oxidizing agent or as a reducing agent. | | | | 1 |
| 20 | ClO2 | | | | 1 |
|  | **SECTION C** | | | |  |
| 21 |  | | | | 2 |
| 22 | 1. A mole contains 6.022 × 1023 atoms/molecules. 2. A mole of a substance denotes the molecular mass of that substance. | | | | 2 |
| 23 |  | | | | 2 |
| 24 | Average Bond Enthalpy is the total bond dissociation enthalpy divided by the number of bonds broken.  The bond enthalpies of O-H bonds in H2O are different because of the different chemical (electronic) environments around the oxygen atom. | | | | 2 |
| 25 | Cr (OH)4- (aq) + H2O2(aq) → CrO42-(aq) + H2O (l)  **O:** Cr(OH)4- → CrO42-  **R:** H2O2 → 2H2O  O: Cr(OH)4- → CrO42- + 4H+ + 3e-  **R:** H2O2 + 2H+ + 2e- → 2H2O] x 3  2Cr(OH)4- + 3H2O2 → 2CrO42- + 6H2O + 2H+ | | | | 2 |
| 26 | 1. sp3 2. sp2 3. sp3 4. sp | | | | 2 |
| 27 | Structure of Atom Chemistry Class 11 Important Extra Questions Chemistry 19 | | | | 2 |
|  | **SECTION D** | | | |  |
| 28 | a) Heisenberg Uncertainty Principle- It is not possible to precisely measure the momentum and position of an electron at the same time.  b) [Ar] 3d10 4s1  c) Hund's rule: Every orbital in a sublevel is singly occupied before the electrons pair up. All the electrons in singly occupied orbitals have the same spin. | | | | 3 |
| 29 | 1. A chemical compound is always found, to be made up of the same elements combined in the same fixed proportion by weight. 2. % of Cu in copper oxide in 1st case = 2.16×100/2.70 = 80   % of oxygen = 20%  % of Cu in copper oxide in 2nd case = 0.92×100/1.15 = 80  % of oxygen = 20%  Thus, the percentage of copper in copper oxide from both experiments is the same. Hence the above data illustrates the law of definite proportions. | | | | 3 |
| 30 | a) The bond dipoles and the orbital dipole are in the same direction for NH3and add up, whereas, in NF3 they are in opposite directions and get canceled to some extent.  b) The net dipole moment of CO2 is zero whereas H2O has a considerable value (of 1.85D).  c) O2+ | | | | 3 |
| 31 | a) 1s22s22p63s23p63d4  b) *n*=4, *l*=0, *ml*=0, ms = +1/2  c) Cu2+ has one, Fe2+ four, and Cr3+ has three unpaired electrons. Hence has Fe2+ highest paramagnetism. | | | | 3 |
| 32 | Mole fraction of water, *XA* =1−*XB* =1−0.0108 =0.989 = 0.99  The density of the solution is 1.2 g mol L (given) | | | | 3 |
| 33 |  | | | |  |
| 34 | 2. Isoelectronic species 3. BF3 (120º) > CH4 (109.5º) > NH3 (107º) > H2O (104.5º) | | | | 3 |
|  | **SECTION E** | | | |  |
| 35 | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Element | % | At.mass | No. of moles | Simple ratio | Simplest whole no. ratio | | C  H  O | 40.687  5.085  54.228 | 12  1  16 | 40.687 = 3.390  12  5.085 = 5.085  1  54.228 = 3.389  16 | 3.390 = 1  3.389  5.085 = 1.5  3.389  3.389 = 1  3.389 | 2  3  2 |   The empirical formula of the compound is C2H3O2  Molecular mass of compound = 2 × V.D. = 2 × 59 = 118  n = Mol. Mass  Empirical formula mass = 118 = 2  59  ∴ Molecular formula of the compound = n × empirical formula = 2 × C2H3O2  = C4H6O4.   1. One molal solution is defined as a solution containing one mole of a solute per kilogram or 1000 g of solvent.   **OR**    Since 10 mols of CaCO3 require 20 mols of HCl, HCl is the L,R    Mass of CaCl2 formed = 0.095× Molar mass of CaCl2​=0.095×111=10.54 g  b) 18.0 g of H2O contain = 6.022 × 10 23 =6.022×1023 molecules  0.05 g of H2O contain molecules = 0.05×6.022×1023 = 1.672×1021 molecules  18 | | | | (5)  4  +  1  3  +  2 |
| 36 | The wavelength, 238.5 x 10-36 is too small to be observed.   1. The angular momentum of the electron is given by: mvr=nh/2π........(1) According to de Broglie’s equation: λ=h/mv or mv=hλ......(2) Substituting the value of ‘mv’ from expression (2) in expression (1): hr/λ=nh/2π   or 2πr=nλ.......(3)  **OR**  a) v=h/mλ = 6.626 x 10-34  9.11 x 10-31 x 4.9 x 10-12 Substituting values, v =1.484× 108 m/s  b) For ṽ to be minimum, *nf* should be minimum. For the Balmer series, a transition from *ni* = 2 to *nf* = 3 is allowed.    ṽ= 1.5236 × 106 m–1  c) 4dxy, 4dxz, 4dz2 | | | | 3+2 |
| 37 | 1. LiI < LiBr < LiCl 2. i. In BF3, boron is sp2 hybridized, so it is trigonal planar. In NH3. nitrogen Is sp3-hybridized. Due to the presence of one lone pair the structure is distorted and becomes pyramidal.   ii. The two bond dipoles in CO2 opposite to each other, cancel, and there is no net dipole moment. Thus, the molecule is non-polar      **OR**   1. i. Lewis dot structure of PCl5 2. p-nitrophenol has a higher boiling point because it has intermolecular H-bonding while o-nitrophenol, has intramolecular H-bonding. 3. i. Ground state- C is 1s2 2s2 2px12py1   Excited state- C- 1s2 2s1 2px12py12pz1  ii.  acetylene-sp-hybridization-example bond angle shape structure geometry  iii. Linear geometry and sp hybridization | | | |  |