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| **HY/CH/1119B 17/12/2019** | | | |
| **HALF YEARLY EXAMINATION (2019-2020)** | | | |
| **Subject: CHEMISTRY(ANSWER KEY)**  **Grade: XI** | | Max. Marks: 70Time: 3 Hours | |
| 1. | (ii) 1.66 M | | 1 |
| 2. | (ii) 1s2 2s2 2p6 3s2 3p6 3d9 4s2 | | 1 |
| 3. | (i) Na < Mg > Al < Si | | 1 |
| 4. | (i) 6, 19 | | 1 |
| 5. | (ii) sp, sp2 and sp3 | | 1 |
| 6. | (iii) A is false but R is true. | | 1 |
| 7. | (i) Both A and R are true and R is the correct explanation of A. | | 1 |
| 8. | (i) Both A and R are correct and R is the correct explanation of A. | | 1 |
| 9. | (i) Both A and R are true and R is the correct explanation of A. | | 1 |
| 10. | (iii) A is true and R is false. | | 1 |
| 11. | 1 – Bromopentane | | 1 |
| 12. | CH3CH2CH2CH(Br)CH2Br CH3CH2CH2C≡CH | | 1 |
| 13. | CH3CH2CH2CH=CH2 | | 1 |
| 14. | CH3CH2CH2C≡CH CH3CH2CH2CH2CH3 | | 1 |
| 15. | CH3CH2CH2CH2CH3  CH3CHCH2CH3  Anh.AlCl3 |  HCl CH3 | | 1 |
| 16. | Related image (or any other) | | 1 |
| 17. |  | |  |
| 18. | Sulphur dichloride SCl2 | | 1 |
| 19. | Draw the anti-bonding Molecular orbital formed by the overlap of 2pz orbitals | | 1 |
| 20. | Bond order is directly proportional to bond enthalpy. | | 1 |
| 21. | a) This is because fully-filled configuration is more stable.  b) 5f | | 1  1 |
| 22. | Give reason for the following:   1. Transition series involves filling up of d-orbitals which can accommodate 10 electrons. 2. The cations have lesser number of electrons than protons as a result their Zeff is higher.   **OR**  Across the period the size decreases and Zeff increases, as a result IE1 of Mg is higher than Na. The 2nd electron in Na is lost from an inner shell with a complete octet whereas for Mg , it is lost from the same valence shell. Hence the IE2 of Na is much higher than Mg. | | 1  1  2 |
| 23. | Carbonate ion is present in the form of a resonating hybrid structure. These structures are equivalent in nature. Resonance all 3 C-O bonds get a double character in one of the resonating structures.  Thus, all the bonds are equivalent and have equal length hence carbonate ion cannot be represented by a single Lewis structure. | | 1  1 |
| 24. | Presence of Br increases the electron density on carbon due to – I effect, thereby destabilizing it.  (ii)  Cl helps in dispersing the negative charge on carbon due to – I effect. | | 1  1 |
| 25. | Pairing up in 2px is not possible  Hund’s rule : statement  B= 1s2 2s2 2px1 2py1  **OR**  Statement  Consider 2 electrons present in 1s orbital   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Electron | n | l | ml | ms | | 1st electron | 1 | 0 | 0 | ½ | | 2nd electron | 1 | 0 | 0 | 1/2 | | | ½  1  ½  1  1 |
| 26. | Similarity in properties  of pairs of **diagonally** adjacent elements in the second and third periods (first 20 elements) of the periodic table.  Al. | | 1  1 |
| 27. | What are the quantum numbers for?  a) n=2, l=1 , ml = - 1 , ms = ½  b) n=4, l=0 , ml = 0 , ms = ½ | | 1  1 |
| 28.. | a) HF is involved in strong intermolecular H-bonding whereas HCl is not.  b) Predict the structure of the following using VSEPR theory:  NH4+ = Tetrahedral    XeF4 = Square planar    BrF5 =Square pyramidal  Image result for structure of BrF5 according to vsepr theory  AsF5 = Trigonal bipyramidal  Image result for structure of AsF5 according to vsepr theory  **OR**  a) N2< SO2 < ClF3 < K2O < LiF  b) NH3 has 1 lone pair and H2O has 2 lone pairs . Since lp- lp repulsions> lp –bp repulsions > bp-bp repulsions, as a result the bond angle in H2O is reduced to a larger extent. | | 1  ½  ½  ½  ½  1  2 |
| 29. | i) Zn + Cu+2 Zn+2 + Cu  ii) E◦cell = E◦c - E○A  = 0.34 – ( - 0.76) = 1.10 V  iii) Zn(s) | Zn+2(1 M) || Cu+2(1M) | Cu(s) | | 1  1  1 |
| 30. | a) Pentane – 2,4 – dione  b)  Image result for resonance structures of chlorobenzene  **OR**  a) Electrophiles: A reagent that takes away an electron pair from reactive site is called electrophile (E+) i.e., electron seeking  Nucleophiles. A reagent that brings an electron pair to the reactive site is called a nucleophile (Nu:) i.e., nucleus seeking  b) Classify the following pairs as position, chain, functional isomers or metamers:  i) Ethanol and Dimethylether : functional isomers  ii) Pentan -2 – one and Pentan – 3 – one : metamers  iii) 2 – methylbutane and 2,2 – dimethylpropane : chain isomers  iv) Pent – 1- yne and Pent -2 – yne : position isomers | | 1  2  1  ½ each |
| 31. | a) A reagent which is present to lesser extent and hence gets consumed first during the reaction is called limiting reagent.  b) 80g O2 is the limiting reagent here.  because from theoretical calculations we get   2H2       +        O2       =       2 H2O    4g                   32g                 36g    80g                 640g               720g  so we have less amount of O2 than require amount.that is why O2 is limiting .  from 32g O2 we get 36g of H2O           80g O2 we get 90g of H2O | | 1  1  ½  1/2 |
| 32. | a) CH3 -C≡C – H + Na CH3 -C≡C – Na + ½ H2  CH3 - C≡C-CH3  + Na No reaction  b)  .  Staggered form is more stable as the C – H sigma bond electrons are farthest and hence there is minimum repulsion. | | 1  1  1 |
| 33. | a) Cl2 < Cl2O = NaClO < NaClO3 < Cl2O7  b) Give reason :  i) SO2 is in its intermediate oxidation state hence can undergo both oxidantion and reduction but HNO3 is in its highest oxidation state hence can act as an oxidant.  ii) Fluorine is so highly reactive that it displaces oxygen from water. | | 1  1  1 |
| 34. | a) **molarity** changes with temperature because of expansion or contraction of the liquid with temperature.But **molality** does not changes with temperature because the mass of the solvent does not change with change with temperature.  b) No. of moles of A = 1  Mass of water = 1000g No. of moles of water = 1000/18 = 55.55  Mole fraction of A = No. of moles of A/ No. of moles of water  = 1 / 55.55 = 0.018 | | 1  ½  ½  1 |
| 35. | a)    b)    c) It follows Markovnikov’s rule : during the addition of an unsymmetrical reagent across an unsymmetrical alkene, the positive part of the addendum adds to the carbon with more number of hydrogen atoms.    The carbocation (b) is attacked by Br– ion to form the product    **OR**  a) Formation of ethane is a result of the termination of chain reactions taking place as a result of  reaction between two methyl free radicals.  b) Benzene is a planar molecule having delocalized electrons above and below the plane of ring. Hence, it is electron-rich. As a result, it is highly attractive to electron deficient species i.e., **electrophiles**. ... Hence, benzene undergoes nucleophilic substitutions with difficulty.  c) Huckel’s rule for aromaticity:  (i) Planarity (ii) Complete delocalisation of the π electrons in the ring (iii) Presence of (4n + 2) π electrons in the ring where n is an integer | | 1  1  1  2  1  1  3 |
| 36. | a) 7 σ and 2 π bonds in CH2=CH=CH2.  b) In MgO, the ionic bond is stronger than in NaCl because of more charge on the ionic species in the former (Mg+2 and O2-as compared to Na+ and Cl-). Because of this the ionic interactions are stronger in MgO than in NaCl. As a result the lattice enthalpy of MgO is higher than NaCl.  c) PCl5 is sp3d hybridised molecule. It has trigonal bipyramidal geometry.    In this case the axial bonds are slightly longer than the equatorial bonds. This is because the axial bonds experience greater repulsion (90◦) from the 3 equatorial bonds.  **OR**  a)  Related image  b) The number of electrons present in Be_2 molecule = 2(4) = 8  The molecular orbital configuration of Be_2 molecule will be,    B.O = ½ (4 – 4 ) = 0 hence the molecule does not exist.  c) According to Fajan’s rule for two cations with similar size, the cation with a pseudo noble configuration has greater polarizing power than the cation with a noble gas inner core. Hence CuCl is more covalent. | | 1  2  1  1  2  2  1 |
| 37. | a) As branching increases the molecule becomes more spherical, the surface area decreases, van der Waals forces decrease thereby boiling point decreases.  b) How will you convert the following :  i) Ethyne to p – nitrobenzene      ii) Hexane to acetophenone      iii) Propyne to propanone.    **OR**  a) Toluene , as it activates the benzene ring towards electrophilic substitution reaction.  b)  The rotation about carbon-carbon single bond of ethane is restricted because of repulsion between electron cloud of C-H **bonds** on either **carbon** atoms..  c) Complete the following :  i) CH3COOH  ii) CH3COCH3 + HCHO  iii) CH2(OH) – CH2(OH) | | 1  1  1  1  1  1  3 |