|  |  |  |  |
| --- | --- | --- | --- |
|  | | | |
| **HY/CHAK/1119A 04/12/2019** | | | |
| **HALF YEARLY EXAMINATION- I (2019-20)** | | | |
| **Subject: CHEMISTRY**  **Grade: XI** | | Max. Marks: 70Time: 3 Hrs | |
| 1. | Ag <Cu< Fe<Cr<Zn | | 1 |
| 2. | Zn>Fe>Cu>Ag | | 1 |
| 3. | Find Ecell0 value for 2Ag(s) + Cu2+(aq) 🡪 2Ag + (aq) + Cu(s)and predict the reaction is feasible or not.  Ecell0 = 0.34 – 0.8 =- 0.46 , therefore Cell is not feasible | | 1 |
| 4. | Zn electrode | | 1 |
| 5. | i- maintains electrical neutrality ii. Completes electrical circuit | | 1 |
|  | **Questions 6 to 10 are one-word answers:** | |  |
| 6. | i) 3d ii) 3s Or  2 | | 1 |
| 7. | H2O, < NH3 < CH4 | | 1 |
| 8. | 1. *SP2 to SP3* | | 1 |
| 9. | 3  Or  Write the bond line structural formulae for CH3-CH2-CH2-CH2-CO-CH2Br I mark for structure | | 1 |
| 10. | IUPAC names of C6H5-CH=CH-CHO is 3-Phenylprop-2-enal | | 1 |
|  |  | |  |
| 11. | * **(i) 6, 19** | | 1 |
| 12. | **(iv) 4, 0** | | 1 |
| 13. | * + **(iii) decreases the electron density at ortho and para position of the ring relative to meta position by resonance.** | | 1 |
| 14. | * + **(i) 12.044 × 1020 molecules** | | 1 |
| 15. | * + **(i) Na < Mg > Al < Si** | | 1 |
|  | **Question number 16-20 are assertion-Reason based questions:**  **Note :** 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.   1. Both assertion and reason are true, and reason is the correct explanation of the assertion. 2. Both assertion and reason are true but reason is not the correct explanation of assertion. 3. Assertion is true but reason is not true. 4. Assertion is not true but reason is true. | |  |
| 16. | B. Both assertion and reason are true but reason is not the correct explanation of assertion. | | 1 |
| 17. | 1. A.Both assertion and reason are true, and reason is the correct explanation of the assertion | | 1 |
| 18. | **B.**Both assertion and reason are true but reason is not the correct explanation of assertion. | | 1 |
| 19. | **A.**Both assertion and reason are true, and reason is the correct explanation of the assertion | | 1 |
| 20. | C.Assertion is true but reason is not true | | 1 |
|  | **SECTION – B** | |  |
| 21. | 1. Presence of double bond and presence of two different atoms or groups of atoms - 1 mark 2. due to delocalization pi electron are equally distributed between 6 carbon atoms 1 mark Or   Explain the following with the help of suitable equation.   1. Friedal craft acylation  1 mark 2. Wurtz reaction  1 mark | | 2 |
| 22. | Addition of HBr to propene yields 2-bromopropane. Give mechanism of the reaction involved. | | 2 |
| 23. | a. Butanal and butanone are the ozonolysis products of an alkene? What is the structural formula of the alkene? 3 methylhept-3-ene- 1 mark  b. Explain why the following systems is not aromatic?  4n+2 = 8 , n = 1.5 do does not follow Huckels rule – 1 mark | | 2 |
| 24. | In NH3 ---Had there been a bp in place of lp the shape would have been tetrahedral but one lone pair is present and due to the repulsion between lp-bp (which is more than bp-bp repulsion) the angle between bond pairs is reduced to 107° from 109.5°. 1 mark  Due to presence of 4 bond pair shape of CH4 is tetrahedral- 1 mark  Or  Predict the shapes of the following molecules/ions using VSEPR Theory: 1 mark each without structure – deduct ½ mark each (i) BrF5 5 BP, 1 LP = square pyramidal(ii) XeF4 4 BP , 2 LP = Sq Planar | | 2 |
| 25. | So, 25 ml of 0.75 M HCl will contain HCl = 0.75x25/1000 = 0.01875 mol  2 mol of HCl reacts with = 1 mol of CaCO3  So, 0.01875 mol of HCl will react with = 1x0.01875/2 = 0.009375 mol 1 mark  Molar mass of CaCO3 = 100 g  Hence, the mass of 0.009375 mol of CaCO3= no. of moles x molar mass                                                                 = 0.009375 x 100 = 0.9375 g 1 mark | | 2 |
| 26. | Cr3+  - 1s2 2s2 2p6 3s2 3p6 3d3 , Al3+  - 1s2 2s2 2p6 - 1 mark | | 2 |
| 27. | b) 19th electron of K  n= 4 l =0 ml= 0 ms =+1/2 or – ½ -1 mark  c) 21st electron of Sc  n= 3 l = 2 m= -2,-1,0,+1,+2 ( any one) m s =+1/2 or – 1/2 1 mark | | 2 |
|  | **SECTION – C** | | 3 |
| 28. | How will you convert benzene into - 1 mark each (i) p-nitrobromobenzene  (ii) m- nitrochlorobenzene  (iii) p – nitrotoluene | | 3 |
| 29. | Balance the given redox equation in acidic medium by Half - Reaction method ( Ion – Electron method ) :  *Cr2O72**– ( aq )  + SO2(g) → Cr 3+( aq ) + SO42**– ( aq )*  OR  Balance the given redox equation in basic medium by Half - Reaction method ( Ion – Electron method ) :  *MnO4 – (aq) + I – (aq) → MnO2 (s) + I2(s)*  *1 mark each for both half reactions balancing with steps , and one mark for net equation*  *Deduct one mark if steps are not shown* | |  |
| 30. | What is resonance? Draw the resonating structures for Aniline showing electron shift using curved arrow notation.  According to the concept of resonance, whenever a single Lewis structure cannot describe a molecule accurately, a number of structures with similar energy, positions of nuclei, bonding and non-bonding pairs of electrons are taken as the canonical structures of the hybrid which describes the molecule accurately – 1 mark  See the source image 2 marks | | 3 |
| 31. | Give reason of the following - 1 mark each   1. The halogens have a strong tendency to accept electrons  1. due to their small size and effective nuclear charge so they have maximum negative electron gain enthalpy in their respective periods of the periodic table. 2. After getting one electron halogens get electronic configuration od nearest inert gas 2. Second ionisation enthalpy is usually greater than the first ionisation energy because after removal of first electron, the remaining electrons are held more firmly by the nucleus as no of protons remains same and thus the atom has greater nuclear charge which makes the removal of second electron difficult and thus greater second ionisation energy. 3. Cations are always smaller than their parent atoms this is because they have lesser no of shells and more effective nuclear charge per electron. they have lesser electrons, while their nuclear charge remains the same.The remaining electrons are, therefore held more tightly by the protons in the nucleus and thus their radii. are smaller than the parent atoms. | | 3 |
| 32. | 1. Write structural formulae of 2 – Formylbut – 3 – enenitrile H2C= CH- CH(CHO) -CN 2. Chloroethanoic acid is stronger acid than ethanoic acid. Explain. **Chloroacetic acid is stronger than acetic acid** because of the electron-withdrawing effect of chlorine. This effect is caused by the electronegativity of chlorine. The withdrawing effect means the negative charge carried on the acetate anion is spread more widely on the molecule, which stabilizes the acetate ions. OR because of the electron-withdrawing effect of chlorine, electron density on O dectrases , O-H bond become more polar , therefore can lose H+ easily 3. What are electrophiles Explain with examples A electrophile is a species (cation) which is electron deficient hence attacked by negatively charged or electron rich species. Any two example ½ mark for definition, ½ for example   Or   1. Which of the two: O2NCH2CH2O– or CH3CH2O– is expected to be more stable and why ?   NO2 group is an electron-withdrawing group. Hence, it shows –I effect. By withdrawing the electrons toward it, the NO2 group decreases the negative charge on the compound, thereby stabilising it. On the other hand, ethyl group is an electron-releasing group. Hence, the ethyl group shows +I effect. This increases the negative charge on the compound, thereby destabilising it. Hence, O2NCH2CH2O– is expected to be more stable than CH3CH2O - 1 mark   1. CH3- CH(OH)-CH2-COCl 1 mark 2. A **nucleophile** is an atom or molecule that donates an electron pair to make a covalent bond. Like OH-, CN- etc | | 3 |
| 33. | (a) Polar molecules have a non-zero net dipole moment. Both CO2 and H2O have two polar bonds. However the dipoles in the linear CO2 molecule cancel each other out, meaning that the CO2 molecule is non-polar. The polar bonds in the bent H2O molecule result in a net dipole moment, so H2O is polar.  (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) In H2O there is hydrogen bonding because oxygen has a high electronegativity. so, the hydrogen atoms from other molecules of **water** forms a hydrogen bonds with oxygen resulting in intermolecular hydrogen bonding. therefore at **room temperature** H2Ois a **liquid** and **H2S is a gas**  Or   * 1. Which compound from each of the following pairs is more covalent and why?  1 mark each – ½ mark for reason i. CuO or CuS ii. PbCl2 or PbCl4   CuS – due to larger size of anion, PbCl4 – due to more oxidation no of Pb, more polarizing  b. Write the favourable factors for the formation of ionic bond. ( any two reason – ½ mark each)  Ionization enthalpy of the substance forming cation should be low  Electron gain enthalpy of the substance forming anion should be more negative  More lattice enthalpy | | 1 x 3 |
| 34. | State the following with suitable example – ½ mark for statement and ½ for example   1. Hund’s Rule of Maximum Multiplicity 2. Aufbau Principle 3. Pauli Exclusion Principle | | 3 |
|  | **SECTION – D** | |  |
| 35. | a. Which of the following has the highest boiling point? Why?  2-Methyl pentane, 2,3-Dimethyl butane, 2,2 - Dimethyl butane 2-Methyl pentane – as boiling point decreases with increase in branching and decrease in surface area, due to decrease in vander waal forces – ½ mark for order, ½ mark foe reason b. Arrange ethene, ethane and ethyne in decreasing order of acidic behaviour. Also give reason for this behaviour. ½ mark for order, 1½ mark foe reason  With increase in s character acidity increases.  Ethyne (H-C≡C-H): here carbon is sp hybridised : % s character = 50 %  Ethene (H2C=CH2): here carbon is sp2hybridised : % s character = 33.3 %  Ethane (H3C-CH3): here carbon is sp3hybridised : % s character = 25 %  As order % s character is ethane< ethene < ethyne, so the order of acidity is ethane< ethene < ethyne.  c. A hydrocarbon 'A' adds one mole of hydrogen in the presence of Pt as catalyst to form n-hexane. 'A' is oxidized vigorously with KMnO4, a single carboxylic acid containing three carbon atoms is isolated. Give the structure and name of 'A' and explain the reactions. 1 mark for identification , 1 for reason    Or  What happens when ( write the reaction involved) – 1 mark each for correct product with equation   1. Bromobutane is treated with alcoholic potassium hydroxide – butene + HBr 2. Sodium propanoate solution is electrolyzed – Butane + 2 NaOH+2H2O+CO2 3. 3-methylpent-2-ene reacts with acidic KMnO4 – ethanoic acid + butanone 4. Propyne reacts with water in the presence of H2SO4 and HgSO4- propanone 5. Ethyne is passes through red hot iron tube at 873K - Benzene | | 5 |
| 36. | 1. Calculate the bond order of : N2 and O2 . Which is more stable at room temperature and why.   1 mark each for calculation of bond order i.e 3 for N2 and 2 for O2,  therefore N2 is more stable at room temperature – 1 mark   1. Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C2H4 and C2H2 molecules.   Image result for ii. Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C2H4 and C2H2 molecules.  Or   1. Use molecular orbital theory to explain why the Ne2 molecule does not exist.   1 mark for calculation of BO. BO = 0 therefore it does not exist   1. Which hybrid orbitals are used by carbon atoms in the following molecules ? deduct ½ mark for any mistake  (a) CH3 –CH=CH2 ; sp3 , sp2 sp2  (b) CH3 -CHO sp3 sp2 2. 2 marks   As the axial bond pairs suffer more repulsive interaction from the equatorial bond pairs, therefore axial bonds have been found to be slightly longer and hence slightly weaker than the equatorial bonds; 1 mark | | 5 |
| 37. | Moles of HCl = M x V = 1/5 x 200/1000 = 1/25 = .04  50 gm of Na2CO3 = 50 / 106 = .47 - 1 mark  Na2CO3 + 2HCl 🡪 2 NaCl + H2O + CO2  1 mole of Na2CO3 reacts with 2 moles of HCl  0.47 will react with – 0.94 moles  As H2O is only 0.4 moles, H2O is limiting agent -1 mark  2 moles of H2O gives – 22.4 l of CO2  So 0.4 moles will give – 0.4 x 22.4 = 8.96 L - 1 mark  2 M aq solution of NaNO3 means 2 moles of NaNO3 are present in 1000 ml of solution  2 moles of NaNO3 contains = 2 x 85 = 170 gm  mass of solution – V x d = 1000 x 1.5 = 1500  mass of solvent = 1500 – 170 = 1330 1mark  m = n x 100 /w2 =2 x 1000/1330 = 150.37 mol/kg - 1mark  M = 4 x 1000 / 893.3 = 4.47 mol/l Or   1. (i) 1 ppm is equivalent to 1 part out of 1 million (106) parts. ∴ Mass percent of 15 ppm chloroform in water   1mark  **(i)**molality (M) = no of moles of solute/mass of solvent in g \*1000   Therefore mass of chloroform= 12 + 1+3(35.5) = 119.5 g/mol   100 g of the sample contains 1.5 × 10–3 g of CHCl3.   ⇒ 1000 g of the sample contains 1.5 × 10–2 g of CHCl3.  m = 1.5 x 10-3/119.5 \* 1000 = 1.25x 10-4 m 2 mark     1. 4 m aq solution of NaNO3 means 4 moles of NaNO3 are present in 100 gm of solvent   4 moles of NaNO3 contains = 4 x 85 = 340 gm - 1mark  V of solution – (1000+340)/ 1.5 = 893.3  M = n x 100 / V = 4 x 1000 / 893.3 = 4.47 mol/l - 1mark | | 5 |

\*\*\*