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| **HY/CH/1119B 04/12/2019** | | | | | |
| **HALF YEARLY EXAMINATION (2019-20)** | | | | | |
| **Subject: CHEMISTRY**  **Grade: XI** | | Max. Marks: 70Time: 3 Hours | | | |
| **Name:** | | | **Section:** | **Roll No:** | |
| ***General Instructions:***   * *This question paper consists of 5 printed pages.* * *All questions are compulsory.*   *(i) Question numbers 1 to 20 are very short-answer questions and carry 1 mark each.*  *(ii) Question numbers 21 to 27 are short-answer questions and carry 2 marks each.*  *(iii) Question numbers 28 to 34 are also short-answer questions and carry 3 marks each.*  *(iv) Question numbers 35 to 37 are long-answer questions and carry 5 marks each.*  *(v) There is no overall choice. However, an internal choice has been provided in two questions of*  *one mark, two questions of two marks, four 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.*   * *The marks for each question are indicated against it.* | | | | | |
| 1. | If 500 mL of a 5M solution is diluted to 1500 mL, what will be the molarity of the solution obtained? (i) 1.5 M (ii) 1.66 M (iii) 0.017 M (iv) 1.59 M | | | | 1 |
| 2. | Which of the following options does not represent ground state electronic configuration of an atom?  (i) 1s2 2s2 2p6 3s2 3p6 3d8 4s2  (ii) 1s2 2s2 2p6 3s2 3p6 3d9 4s2  (iii) 1s2 2s2 2p6 3s2 3p6 3d10 4 s1  (iv) 1s2 2s2 2p6 3s2 3p6 3d5 4s1 | | | | 1 |
| 3. | The first ionisation enthalpies of Na, Mg, Al and Si are in the order:  (i) Na < Mg > Al < Si  (ii) Na > Mg > Al > Si  (iii) Na < Mg < Al < Si  (iv) Na > Mg > Al < Si | | | | 1 |
| 4. | Number of π bonds and σ bonds in the following structure is–    (i) 6, 19  (ii) 4, 20  (iii) 5, 19  (iv) 5, 20 | | | | 1 |
| 5. | The types of hybrid orbitals of nitrogen in NO2+, NO3– and NH 4 + respectively are expected to be:  (i) sp, sp3 and sp2  (ii) sp, sp2 and sp3  (iii) sp2, sp and sp3  (iv) sp2, sp3 and sp | | | | 1 |
|  | In the following questions a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct option out of the choices given below each question: | | | | 1 |
| 6. | Assertion (A) : Combustion of 16 g of methane gives 18 g of water.  Reason (R) : In the combustion of methane, water is one of the products.  (i) Both A and R are true but R is not the correct explanation of A.  (ii) A is true but R is false.  (iii) A is false but R is true.  (iv) Both A and R are false. | | | | 1 |
| 7. | Assertion (A) : The decomposition of hydrogen peroxide to form water and oxygen is an example of disproportionation reaction.  Reason (R) : The oxygen of peroxide is in –1 oxidation state and it is converted to zero oxidation state in O2 and –2 oxidation state in H2O.  (i) Both A and R are true and R is the correct explanation of A.  (ii) Both A and R are true but R is not the correct explanation of A.  (iii) A is true but R is false.  (iv) Both A and R are false. | | | | 1 |
| 8. | Assertion (A) : Pent- 1- ene and pent- 2- ene are position isomers.  Reason (R) : Position isomers differ in the position of functional group or a substituent.  (i) Both A and R are correct and R is the correct explanation of A.  (ii) Both A and R are correct but R is not the correct explanation of A.  (iii) Both A and R are not correct.  (iv) A is not correct but R is correct | | | | 1 |
| 9. | Assertion (A) : Among halogens fluorine is the best oxidant.  Reason (R) : Fluorine is the most electronegative atom.  (i) Both A and R are true and R is the correct explanation of A.  (ii) Both A and R are true but R is not the correct explanation of A.  (iii) A is true but R is false.  (iv) Both A and R are false. | | | | 1 |
| 10. | Assertion (A) : It is impossible to determine the exact position and exact momentum of an electron simultaneously.  Reason (R) : The path of an electron in an atom is clearly defined.  (i) Both A and R are true and R is the correct explanation of A.  (ii) Both A and R are true and R is not the correct explanation of A.  (iii) A is true and R is false.  (iv) Both A and R are false. | | | | 1 |
|  | An alkyl halide C5H11Br (A) reacts with ethanolic KOH to give an alkene ‘B’, which reacts with Br 2 to give a compound ‘C’, which on dehydrobromination gives an alkyne ‘D’. On treatment with sodamide, one mole of ‘D’ gives one mole of the sodium salt of ‘D’ and half a mole of hydrogen gas. Complete hydrogenation of ‘D’ yields a straight chain alkane.  **Now answer the questions 11 – 15 given below:** | | | | 1 |
| 11. | What is the IUPAC name of ‘A’? | | | | 1 |
| 12. | Give the reaction involved in the conversion of ‘C’ to ‘D’. | | | | 1 |
| 13. | Deduce the structure of ‘B’ | | | | 1 |
| 14. | Write the equation for the hydrogenation of ‘D’. | | | | 1 |
| 15. | What will be the product obtained when ‘D’ undergoes isomerization. | | | | 1 |
|  | **Questions 16 – 20 are one word answers:** | | | |  |
| 16. | Give the structure of an odd electron molecule. | | | |  |
| 17. | Write the bondline structural formula of 3,4,4,5 – tetramethylheptane. | | | |  |
| 18. | Name a sulphur compound that obeys octet rule. | | | | 1 |
| 19. | Draw the anti-bonding Molecular orbital formed by the overlap of 2pz orbitals | | | | 1 |
| 20. | How do you express the bond strength in terms of bond order? | | | | 1 |
| 21. | a) The electronic configuration of valence shell of Cu is 3d104s1 and not 3d94s2. How is this configuration explained?  b) Which of the following orbitals has the highest energy?  5p, 5d, 5f, 6s, 6p | | | | 2 |
| 22. | Give reason for the following:   1. There are ten elements in each transition series. 2. The cations are smaller in size than their corresponding neutral atoms.   **OR**  How would you explain the fact that the first ionization enthalpy of sodium is lower than that of magnesium but its second ionization enthalpy is higher than that of magnesium? | | | | 2 |
| 23. | Explain why CO32– ion cannot be represented by a single Lewis structure. How can it be best represented? | | | | 2 |
| 24. | Identify the most stable species in the following set of ions giving reasons : | | | | 2 |
| 25. | What is wrong with the following configurations?  B= 1s2 2s2 2px2 2py  Point out and state the rule, which has been disobeyed while writing the configuration. Also write the correct configuration.  **OR**  State and illustrate the Pauli’s exclusion principle. | | | | 2 |
| 26. | Define diagonal relationship. Name the element that shows diagonal relationship with Be. | | | | 2 |
| 27. | What are the quantum numbers for?  a) 2p electrons in Nitrogen  b) 19th electron of chromium | | | | 2 |
| 28.. | a) Why is HF a liquid whereas HCl a gas?  b) Predict the structure of the following using VSEPR theory:  NH4+ , XeF4 , BrF5 , AsF5  **OR**  a) Arrange the following molecules in the increasing order of ionic character of their bonds : LiF, K2O, N2, SO2, ClF3  b) Although geometries of NH3 and H2O molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss. | | | | 3 |
| 29. | A cell is prepared by dipping copper rod in 1M CuSO4 solution and zinc rod in 1M ZnSO4 solution. The standard reduction potentials of copper and zinc 0.34V and – 0.76 V respectively.  i) What will be the cell reaction?  ii) What will be the emf of the cell?  iii) How will the cell be represented? | | | | 3 |
| 30. | a) Give the IUPAC name of :  Image result for bondline structural formula of hexane - 2,5 - dione  b) Write the various resonance structures for chlorobenzene  **OR**  a) Differentiate between electrophiles and nucleophiles.  b) Classify the following pairs as position, chain, functional isomers or metamers:  i) Ethanol and Dimethylether  ii) Pentan -2 – one and Pentan – 3 – one  iii) 2 – Methylbutane and 2,2 – Dimethylpropane  iv) Pent – 1- yne and Pent -2 – yne | | | | 3 |
| 31. | a) What is meant by a limiting reagent?  b) 80g of H2 are reacted with 80 g of O2 to form water. Find out the mass of water obtained. Which substance is the limiting reagent? | | | | 3 |
| 32. | a) How will you distinguish between the following using a chemical test : CH3 - C≡C-CH3 and CH3 -C≡C – H ?  b) Draw Newman projection formula for ethane. Which out of the two is more stable and why? | | | | 3 |
| 33. | a) Arrange the following in increasing order of oxidation number of chlorine.  NaClO3 , NaClO , Cl2O7 , Cl2O , Cl2  b) Give reason :  i) SO2 is both oxidant and reductant but HNO3 is an oxidant.  ii) Displacement reactions of halogens using fluorine is generally not carried out in aqueous solution. | | | | 3 |
| 34. | a) Why is molality considered better for expressing concentration as compared to molarity?  b) An aqueous solution of a substance A has molality equal to 1. Calculate its mole fraction. | | | | 3 |
| 35. | a) Write the chemical equation for preparation of gammaxene.  b) An alkene A on ozonolysis gave ethanal and penta-3-one as the products. Deduce the structure of A giving its IUPAC name.  c) Addition of HBr to propene yields 2-bromopropane as the major product. Explain and give mechanism.  **OR**  a) How do you account for the formation of ethane during chlorination of methane?  b) Why does benzene undergo electrophilic substitution reactions easily and nucleophilic substitutions with difficulty?  c) State the Huckel’s rule for aromaticity. | | | | 5 |
| 36. | a) Indicate the number of σ and π bonds in CH2=CH=CH2.  b) Out of NaCl and MgO, which has higher lattice enthalpy and why?  c) Describe hybridization in case of PCl5 .Why are axial bonds longer than equatorial bonds in PCl5?  **OR**  a) Differentiate between bonding and anti-bonding molecular orbitals.(any 2 points)  b) Use molecular orbital theory to explain why the Be2 molecule does not exist.  c) CuCl is more covalent than NaCl. Explain why? | | | | 5 |
|  | a) Explain why the boiling points of the following isomers follows the order:  Pentane> 2- Methyl butane > 2,2 – Dimethyl propane  b) How will you convert the following :  i) Ethyne to nitrobenzene  ii) Hexane to acetophenone  iii) Propyne to propanone. | | | |  |
|  | **OR**  a) Out of benzene, m–dinitrobenzene and toluene which will undergo nitration most easily and why?  b) Rotation around carbon-carbon single bond of ethane is not completely free. Justify the statement. | | | |  |
|  | c) Complete the following :  i)  ii)  iii) | | | |  |