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| **HALF YEARLY EXAMINATION -Answer key(2021-22)** | | | | | | | |
| **Subject: Chemistry**  **Grade: 11** | | | | | Max. Marks: 35Time: 90 min | | |
| **Name:** | | | | | | **Section:** | **Roll No:** |
| ***General Instructions:***   * ***The Question Paper contains three sections.*** * ***Section A has 25 questions. Attempt any 20 questions.*** * ***Section B has 24 questions. Attempt any 20 questions.*** * ***Section C has 6 questions. Attempt any 5 questions.*** * ***All questions carry equal marks.*** * ***There is no negative marking*** | | | | | | | |
| **SECTION A** | | | | | | | |
|  | ***This section consists of 25 multiple choice questions with overall choice to attempt any 20 questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.*** | | | | | | |
| 1. | The density of 3 M solution of NaCl is 1.25 g/l. The molality of solution is : | | | | | | |
|  | A) 2.31m | | A) 2.31m | | | | |
|  | C) 2.51m | | C) 2.51m | | | | |
| 2. | For the electrons of oxygen atom, which of the following statements is correct? | | | | | | |
|  | A) Zeff for an electron in a 2s orbital is the same as Zeff for an electron in a 2p orbital. | | B) An electron in the 2s orbital has the same energy as an electron in the 2p orbital. | | | | |
|  | C) Zeff for an electron in 1s orbital is the same as Zeff for an electron in a 2s orbital. | | D) The two electrons present in the 2s orbital have same spin quantum numbers, but of opposite sign. | | | | |
| 3. | Which of the following cation has the smallest radius? | | | | | | |
|  | A) Na+ | | B) Li+ | | | | |
|  | C) Be2+ | | D) K+ | | | | |
| 4. | Among the following the maximum covalent character is shown by the compound | | | | | | |
|  | A) MgCl2 | | B) FeCl2 | | | | |
|  | C)  SnCl2 | | D)  AlCl3 | | | | |
| 5. | The I.U.P.A.C. name of CH3COCH(CH3)2 is- | | | | | | |
|  | A) 3-Methyl-2-butanone | | B)  Isopropyl methyl ketone | | | | |
|  | C) 2-Methyl-3-butanone | | D) 4-Methyl isopropyl ketone | | | | |
| 6. | What is the change in oxidation number of carbons in the following reaction?  CH4(g) + 4Cl2(g) → CCl4(l) + 4HCl(g) | | | | | | |
|  | A) –4 to +4 | | B) 0 to –4 | | | | |
|  | C) +4 to +4 | | D) 0 to +4 | | | | |
| 7. | Which hybrid orbitals are used by carbon atoms of functional groups in the following molecules?  (i) CH3CHO (ii) CH3COOH | | | | | | |
|  | A) sp and sp | | B) sp and sp2 | | | | |
|  | C) sp2 and sp2 | | D) sp, sp2 and sp3 | | | | |
| 8. | Which pair of elements among the following displays Diagonal relationship? | | | | | | |
|  | A) Al and B | | B) C and B | | | | |
|  | C) Ga and B | | D) Si and B | | | | |
| 9. | The magnetic quantum number specifies | | | | | | |
|  | A) Size of orbitals | | A) Size of orbitals | | | | |
|  | C) Orientation of orbitals | | C) Orientation of orbitals | | | | |
| 10. | 250 ml of a sodium carbonate solution contains 2.65 grams of Na2CO3. If 10 ml of this solution is diluted to one litre, the concentration of the resultant solution (mol. wt. of Na2CO3 = 106) is- | | | | | | |
|  | A) 0.1M | | B) 0.001M | | | | |
|  | C) 0.01M | | D) 1M | | | | |
| 11. | The states of hybridization of C2, C4, C6 and C7 of the hydrocarbon are– | | | | | | |
|  | A) sp, sp2, sp3 and sp2 | | B) sp, sp3, sp2 and sp3 | | | | |
|  | C) sp3, sp2, sp2 and sp | | D) sp, sp2, sp3 and sp3 | | | | |
| 12. | Which of the following types of hybridisations leads to three-dimensional geometry of bonds around the carbon atom? | | | | | | |
|  | A) sp² | | B) sp | | | | |
|  | C)  sp³ | | D) none of these | | | | |
| 13. | The correct IUPAC name of the following compound is- | | | | | | |
|  | A) Hex-4-yn-1-oic acid | | B) Hex-3-yn-1-oic acid | | | | |
|  | C) Hex-5-yn-1-oic acid | | D) Hex-2-yn-6-oic acid | | | | |
| 14. | Which among the following has the largest dipole moment? | | | | | | |
|  | A) NH3 | | B) H2O | | | | |
|  | C) HI | | D) SO3 | | | | |
| 15. | The probability density plots of 1s and 2s orbitals are given. The density of dots in a region represents the probability density of finding electrons in the region. Based on the diagram, which of the following statements is incorrect? | | | | | | |
|  | A) 1s and 2s orbitals are spherical in shape. | | B) The probability of finding the electron is maximum near the nucleus. | | | | |
|  | C) The probability of finding the electron at a given distance for ‘s’ sub-shell is equal in all directions. | | D) The probability density of electrons for 2s orbital decreases uniformly as distance from the nucleus increases. | | | | |
| 16. | Which of the transformations will need the maximum amount of energy? | | | | | | |
|  | A) Na → Na++ e– | | B) Ca+ → Ca2++ e– | | | | |
|  | C) K+ → K2 ++ e– | | D) C2+ → C3++ e– | | | | |
| 17. | The charge/size ratio of a cation determines its polarizing power. Which one of the following sequences represents the increasing order of the polarizing power of the cationic species, K+, Ca++, Mg2+, Be2+? | | | | | | |
|  | A) Ca2+ < Mg2+ < Be+ < K+ | | B) Mg2+ < Be2+ < K+ < Ca2+ | | | | |
|  | C)  Be2+ < K+ < Ca2+ < Mg2+ | | D)  K+ < Ca2+ < Mg2+ < Be2+ | | | | |
| 18. | A tertiary butyl carbocation is more stable than a secondary butyl carbocation because of which of the following? | | | | | | |
|  | A) –R effect of –CH3 groups | | B) Hyperconjugation | | | | |
|  | C) –I effect of –CH3 groups | | D) Electromeric effect | | | | |
| 19. | The species Ar, K+ and Ca2+ contain the same number of electrons. In which order do their radii increase? | | | | | | |
|  | A) Ca2+ < Ar < K+ | | B) Ca2+ < K+ < Ar | | | | |
|  | C) K+ < Ar < Ca2+ | | D) Ar < K+ < Ca2+ | | | | |
| 20. | Which oxide among the following is the most acidic? | | | | | | |
|  | A) MgO | | B) CaO | | | | |
|  | C) Al2O3 | | D) Na2O | | | | |
| 21. | The correct IUPAC name of the given organic compound is- | | | | | | |
|  | A) 2,3,3-Trimethylcyclobutene | | B) 1,4,4-Trimethylcyclobutene | | | | |
|  | C) 1,2,2-Trimethylcyclobutene | | D) 1,1,2-Trimethylcyclobutene | | | | |
| 22. | Inner transition elements have a general electronic configuration of- | | | | | | |
|  | A) (n-2) f 1-14(n-1) d 1-2ns0 | | B) (n-2) f 1-14(n-1) d 1-10ns0-1 | | | | |
|  | C) (n-2) f 1-14(n-1) d 1-10ns2 | | D) (n-2) f 1-14(n-1) d10ns1 | | | | |
| 23. | Number of water molecules present in a drop of water (volume 0.0018 ml) at room temperature is | | | | | | |
|  | A) 6.023 × 1019 | | B) 4.84 × 1017 | | | | |
|  | C) 1.084 × 1018 | | D) 6.023 × 1023 | | | | |
| 24. | The correct electronic configuration of Cu2+ ion is- | | | | | | |
|  | A) 1s2 2s2 2p6 3s2 3p6 3d9 | | B) 1s2 2s2 2p6 3s2 3p6 3d10 4s1 | | | | |
|  | C) 1s2 2s2 2p6 3s2 3p6 4s2 | | D) 1s2 2s2 2p6 3s2 3p6 3d8 4s1 | | | | |
| 25. | Which of the following is a linear molecule? | | | | | | |
|  | A) ClO2 | | B) CO2 | | | | |
|  | C) NO2 | | D) SO2 | | | | |
|  | **SECTION-B** | | | | | | |
|  | **This section consists of 24 multiple choice questions with overall choice to attempt any 20**  **questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.** | | | | | | |
| 26. | Which of the following has the maximum bond angle? | | | | | | |
|  | A) NO2 - | | B) NO2 + | | | | |
|  | C) NO3 - | | D) NO2 | | | | |
| 27. | The reaction in which chlorine undergoes disproportionation is- | | | | | | |
|  | A) NaOH(aq) + NH4Cl(aq)  NaCl(aq) + NH3(aq) + H2O(l) | | B) Na(s) + Cl2(g) --> NaCl(s) | | | | |
|  | C) Cl2(g) + H2O (l)  →HCl + HClO | | D) Cl2 + 2I- → 2Cl- +I2 | | | | |
| 28. | 6.02 × 1020 molecules of urea are present in 100 mL of its solution. The concentration of solution is | | | | | | |
|  | A) 0.02 M | | B) 0.01 M | | | | |
|  | C) 0.001 M | | D) 0.1 M | | | | |
| 29. | CH3CH2Cl undergoes homolytic fission to produce- | | | | | | |
|  | A) CH3CH**.**2 and Cl**.** | | B)  CH3CH2+ and Cl– | | | | |
|  | C) CH3CH2+ and Cl**.** | | D) CH3CH**.**2 and Cl– | | | | |
| 30. | If travelling at same speeds, which of the following matter waves have the shortest wavelength? | | | | | | |
|  | A) Electron | | B) Alpha particle (He2+) | | | | |
|  | C) Neutron | | D) Proton | | | | |
| 31. | Amount of CO2 produced when one mole of carbon reacts with 16g of oxygen is- | | | | | | |
|  | A) 44g | | B) 22g | | | | |
|  | C) 32g | | D) 16g | | | | |
| 32. | Which of the following are iso-structural? | | | | | | |
|  | A) XeF2, CO2 | | B) NH3, BF3 | | | | |
|  | C) PCl5, ICl5 | | D) CO32-, SO32- | | | | |
| 33. | Identify the correct pair of nucleophiles- | | | | | | |
|  | A) NH4+, CH3- | | B) CO2, H2O | | | | |
|  | C)  BF3, CH3+ | | D) CH3NH2, CH3- | | | | |
| 34. | Which of the following is the principal quantum number for the last electron of sodium atom? | | | | | | |
|  | A) 1 | | B) 2 | | | | |
|  | C) 3 | | D) 4 | | | | |
| 35. | In the reaction, Ba(s) + O2(g) → BaO2(s)  The oxidation state of oxygen- | | | | | | |
|  | A) remains the same | | B) changes from 0 to -2 | | | | |
|  | C) changes from 0 to -1 | | D) changes from -1 to -2 | | | | |
| 36. | Number of atoms of He in 100 u of He (Atomic mass of He is 4 u) - | | | | | | |
|  | A) 25 | | B) 50 | | | | |
|  | C) 100 | | D) 400 | | | | |
| 37. | Which of the following reactions does not involve either oxidation or reduction? | | | | | | |
|  | A) VO2+ → V2O4 | | B) Na → Na+ | | | | |
|  | C)  CrO42- → Cr2O72- | | D) Zn2+ →Zn | | | | |
| 38. | The I.U.P.A.C. name of CH3 – CH = CH COO C2H5 is | | | | | | |
|  | A) Ethyl but-1 -enoate | | B)  Ethyl but-2-enoate | | | | |
|  | C) Ethyl prop-2-enoate | | D) Methyl but-1 -enoate | | | | |
| 39. | A table-tennis ball has a mass 10 g and a speed of 90 m/s. If speed can be measured within an accuracy of 4%, the uncertainty in speed and position is- | | | | | | |
|  | A) 4.6 ms-1 and 1.46 × 10–33 m | | B) 5.6 ms-1 and 1.56 × 10–33 m | | | | |
|  | C) 3.6 ms-1 and 1.46 × 10–33 m | | D) 6.6 ms-1 and 1.66 × 10–33 m | | | | |
| 40. | (x) MnO−4 + (y) H2O2 + (z)H+→ Mn2+ + H2O + O2 . In this reaction the value of (x),(y) and (z) are- | | | | | | |
|  | A) 2, 5, 6 | | B)  5, 2, 9 | | | | |
|  | C) 3, 5, 5 | | D) 2, 6, 6 | | | | |
| 41. | What is the amount of water produced when 8g of hydrogen is reacted with 32g of oxygen? | | | | | | |
|  | A) 2 moles | | A) 2 moles | | | | |
|  | C) 3 moles | | C) 3 moles | | | | |
| 42. | In the ground state an element has 13 electrons in its M shell. The element is | | | | | | |
|  | A) manganese | | A) manganese | | | | |
|  | C) nickel | | C) nickel | | | | |
| 43. | Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states? | | | | | | |
|  | A) 3d24s2 | | B) 3d3 4s2 | | | | |
|  | C) 3d5 4s1 | | D) 3d5 4s2 | | | | |
| 44. | Inductive effect involves- | | | | | | |
|  | A) displacement of σ electrons | | B) delocalization of π electrons | | | | |
|  | C) delocalization of σ-electrons | | D) displacement of π-electrons | | | | |
| 45. | Assertion (A): In the reaction Cu2+(aq) + Zn(s) → Zn2+(aq) + Cu(s), Zn acts as a reducing agent.  Reason (R): Reducing agents lose electrons. | | | | | | |
|  | **a.** | Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion. | **b.** | Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion. | | | |
|  | **c.** | Assertion is correct, but Reason is incorrect statement. | **d.** | Assertion is incorrect but Reason is correct statement. | | | |
| 46. | 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. | | | | | | |
|  | **a.** | Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion. | **b.** | Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion. | | | |
|  | **c.** | Assertion is correct, but Reason is incorrect statement. | **d.** | Assertion is incorrect but Reason is correct statement. | | | |
| 47. | Assertion (A): Simple carbanions are isoelectronic and isostructural with ammonia.  Reason (R): Carbanions have seven electrons around carbon atom. | | | | | | |
|  | **a.** | Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion. | **b.** | Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion. | | | |
|  | **c.** | Assertion is correct, but Reason is incorrect statement. | **d.** | Assertion is incorrect but Reason is correct statement. | | | |
| 48. | Assertion (A) : Boron has a smaller first ionisation enthalpy than beryllium. Reason (R) : The penetration of a 2s electron to the nucleus is less than the 2p electron hence 2p electron is less shielded by the inner core of electrons than the 2s electrons. | | | | | | |
|  | **a.** | Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion. | **b.** | Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion. | | | |
|  | **c.** | Assertion is correct, but Reason is incorrect statement. | **d.** | Assertion is incorrect but Reason is correct statement. | | | |
| 49. | Assertion: The order of bond lengths in the dicarbon species, C2, C2-, C22- is given by-  C2 > C2- > C22-  Reason: More the bond order, more is the bond length. Therefore C2 bond is the longest. | | | | | | |
|  | **a.** | Both Assertion and Reason are correct statements and Reason is the correct explanation of the Assertion. | **b.** | Both Assertion and Reason are correct statements, but Reason is not the correct explanation of the Assertion. | | | |
|  | **c.** | Assertion is correct, but Reason is incorrect statement. | **d.** | Assertion is incorrect but Reason is correct statement. | | | |
|  | **SECTION-C** | | | | | | |
|  | **This section consists of 6 multiple choice questions with an overall choice to attempt any 5. In**  **case more than desirable number of questions is attempted, ONLY first 5 will be considered**  **for evaluation.** | | | | | | |
| 50. | Match the following:   |  |  |  |  | | --- | --- | --- | --- | | Column I | | Column II | | | a) | Carbocation | i) | Ethyne | | b) | Nucleophile | ii) | On the demand of an attacking reagent | | c) | sp hybridization | iii) | sp2 hybridized carbon with empty p-orbital | | d) | Hyperconjugation | iv) | Propene | | e) | Electromeric effect | v) | Can supply a pair of electrons |   Which of the following is the best matched option? | | | | | | |
|  | A) a-v, b-iii, c-i, d-iv, e-ii | | B) a-iii, b-v, c-i, d-ii, e-iv | | | | |
|  | C) a-iii, b-v, c-i, d-iv, e-ii | | D) a-ii, b-v, c-i, d-iv, e-iii | | | | |
| 51. | Which of the following analogies is incorrect? | | | | | | |
|  | A) CCl4: Zero dipole moment | | B) C2H4: 5*σ* and 1π | | | | |
|  | C) O22-: Paramagnetic | | D) NH3: Intermolecular H-bonding | | | | |
| 52. | Complete the following analogy- Al2O3: Amphoteric:: Cl2O7: | | | | | | |
|  | A) Neutral | | B) Acidic | | | | |
|  | C) Basic | | D) None of these | | | | |
| CASE | Read the passage given below and answer the following questions 53-55  Redox reactions are oxidation-reduction chemical reactions in which the reactants undergo a change in their oxidation states. The oxidation and reduction reactions always occur simultaneously, so this reaction was named as the redox reaction or Oxidation-Reduction Reaction. The substance getting reduced in a chemical reaction is known as the oxidizing agent, while a substance that is getting oxidized is known as the reducing agent. | | | | | | |
| 53. | In which of the following reaction H2O2 acts as a reducing agent ?  (1) H2O2 + 2H+ + 2e– → 2H2O  (2) H2O2 -2e– → O2+2H+  (3) H2O2 + 2e– → 2OH–  (4) H2O2 + 2OH– -2e– → O2 + 2H2O | | | | | | |
|  | A) 1 and 3 | | B) 2 and 4 | | | | |
|  | C) 2 and 3 | | D) 1,2,3 and 4 | | | | |
| 54. | How many electrons are involved in balancing the half equations in the following unbalanced redox reaction?  Cr2O72- + Fe2+ + → Cr3+ + Fe3+ | | | | | | |
|  | A) 3 | | B) 4 | | | | |
|  | C) 5 | | D) 6 | | | | |
| 55. | Which of the following is a redox reaction ? | | | | | | |
|  | A) NaCl + KNO3 → NaNO3 + KC1 | | B) CaC2O4 + 2HC1 → CaCl2 + H2C2O4 | | | | |
|  | C) Mg(OH)2 + 2NH4C1 → MgCl2 + 2NH4OH | | D) Zn + 2AgCN → 2Ag + Zn(CN)2 | | | | |