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COMBINED COMPETITIVE (PRELIMINARY) EXAMINATION, 2011

Serial No. 000030 **CHEMISTRY** B

Code No. 04

Time Allowed : Two Hours Maximum Marks : 300

INSTRUCTIONS

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- In case you find any discrepancy in this test booklet in any question(s) or the Responses, a written representation explaining the details of such alleged discrepancy, be submitted within three days, indicating the Question No(s) and the Test Booklet Series, in which the discrepancy is alleged. Representation not received within time shall not be entertained at all. The Commission shall take appropriate decision on the representations received in accordance with the Rules which shall be final.
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SEAL

- The 7⁺ oxidation state can be shown by the element :
(A) Mn (B) Co
(C) Fe (D) Cr
- Amongst the following identify the species with an atom in 6⁺ oxidation state :
(A) NiF_6^{2-} (B) $[\text{Cr}(\text{CN})_6]^{3-}$
(C) CrO_2Cl_2 (D) MnO_4^-
- Which of the following is not a redox reaction ?
(A) $\text{O}_2 + 2\text{H}_2 \rightarrow 2\text{H}_2\text{O}$ (B) $\text{MnCl}_2 \rightarrow \text{MnCl}_2 + \frac{1}{2}\text{Cl}_2$
(C) $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \frac{1}{2}\text{H}_2$ (D) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- In the reaction $\text{Fe}_2\text{O}_3 + \frac{3}{2}\text{C} \rightarrow 2\text{Fe} + \frac{3}{2}\text{CO}_2$, the reducing agent is :
(A) Fe^{3+} (B) O_2
(C) C (D) Fe_2O_3
- Conjugate acid of NH_2^- is :
(A) NH_3 (B) NH_4OH
(C) NH_4^+ (D) N_2H_4
- Conjugate base of hydrazoic acid is :
(A) HN_3^- (B) N_3^-
(C) N_2^- (D) N^{3-}
- Which is not the conjugate acid-base pair ?
(A) Cl^- and HCl (B) NH_4^+ and NH_3
(C) H_2O and OH^- (D) H_3O^+ and NH_4^+
- The species that donates the electron pair in the formation of a covalent bond is known as :
(A) Electrophile (B) Lewis acid
(C) Lewis base (D) Hard acid

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9. Which of the following is borax ?

- (A) $\text{Na}_2\text{B}_4\text{O}_6 \cdot 10\text{H}_2\text{O}$ (B) $\text{Ca}_2\text{B}_6\text{O}_{11} \cdot 5\text{H}_2\text{O}$
(C) $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ (D) $\text{Na}_2\text{B}_4\text{O}_7 \cdot 4\text{H}_2\text{O}$

10. Plaster of paris has the formula :

- (A) $\text{MgSO}_4 \cdot \text{H}_2\text{O}$ (B) CaSO_4
(C) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (D) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$

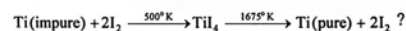
11. Xenon reacts directly with Fluorine in 1 : 5 mixture by heating the gases at 400°C in a sealed nickel tube yields :

- (A) XeF_4 (B) XeF_2
(C) XeF_6 (D) XeF

12. What is the order of conductivity of simple salts of alkali metal ions in water ?

- (A) $\text{Cs}^+ > \text{Li}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+$ (B) $\text{Cs}^+ > \text{Rb}^+ > \text{K}^+ > \text{Na}^+ > \text{Li}^+$
(C) $\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Cs}^+$ (D) $\text{Li}^+ > \text{Na}^+ > \text{Rb}^+ > \text{K}^+ > \text{Cs}^+$

13. Which method of purification is represented by equation



- (A) Zone refining (B) Cupellation
(C) Poling (D) Van Arkel

14. In the Mond's process for the purification of Nickel metal, a compound obtained is :

- (A) $\text{Ni}(\text{CO})_4$ (B) $\text{Ni}(\text{CO})_5$
(C) $\text{Ni}(\text{CO})_6$ (D) $\text{Ni}(\text{CO})_2$

15. Which of the following square planar complexes exhibit geometrical isomerism ?

(M = Metal ion)

- (A) ML_4 (B) MA_2L_2
(C) MAL_3 (D) MLABC

16. Which of the following exhibit linkage isomerism ?

- (A) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ (B) $[\text{Ni}(\text{CO})_4]$
(C) $[(\text{NH}_3)_5\text{CoNO}_2]\text{Cl}_2$ (D) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$

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17. An aqueous solution of FeCl_3 is taken in a test tube and a solution of NaOH is added, results in:

- (A) Blood red colour (B) Blue colour precipitate
(C) Reddish brown precipitate (D) Green colour precipitate

18. The central metal ion in Ferrocene is :

- (A) Fe^{2+} (B) Mg^{2+}
(C) Al^{3+} (D) Pt^{2+}

19. The molecule $\text{Al}_2(\text{CH}_3)_6$ has the type of bonds :

- (A) One three centre and five two centre two electron bonds
(B) All two centre two electron bonds
(C) Three terminal and three bridging methyl groups
(D) Two three centre two electron and four two centre two electron bonds

20. The electronic configuration of F atom is :

- (A) $1\text{S}^2 2\text{S}^2 2\text{P}^6$ (B) $1\text{S}^2 2\text{S}^2 2\text{P}^5$
(C) $1\text{S}^2 2\text{P}^2 2\text{S}^0$ (D) $1\text{S}^2 2\text{S}^2 2\text{P}^1$

21. Benzene from coal-tar is purified by :

- (A) Alkylation (B) Nitration
(C) Acylation (D) Sulphonation

22. How many chemical shifts are given by Ethyl acetate in the $^1\text{H-NMR}$ spectrum ?

- (A) 1 (B) 2
(C) 3 (D) 4

23. Which one of the following is an aldotriose ?

- (A) Glyceraldehyde (B) Arabinose
(C) Xylose (D) Glycolaldehyde

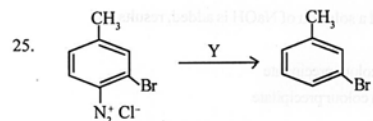
24. Pairs of stereoisomeric ring forms of any sugar are known as :

- (A) Epimers (B) Atropisomers
(C) Cis-trans isomers (D) Anomers

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


What is Y in the above reaction ?

- (A) H_2SO_4 (B) HNO_3
(C) NH_3 (D) $\text{H}_3\text{PO}_4/\text{H}_2\text{O}$
26. Aluminium Chloride in Benzene exist as :
(A) Monomer (B) Dimer
(C) Polymer (D) An octet by π bonding
27. Isoprene is an example of :
(A) Isolated diene (B) Conjugated diene
(C) Cumulative diene (D) Cyclic olefin
28. $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 \xrightarrow{\text{Y}} \text{R}-\text{CN}$
What is Y in the above reaction ?
(A) P_2O_5 (B) NaOH
(C) NaHCO_3 (D) HCN
29. Identify the m-orienting groups in aromatic electrophilic substitution reactions from the following:
(A) SO_2Cl , CN (B) OH , OR
(C) Cl , Br (D) SH , NHCOCH_3
30. 1-Chloro-2-propene is an example of :
(A) Alkyl halide (B) Aryl halide
(C) Vinyl halide (D) Allyl halide
31. In the Reimer-Tieman reaction of phenols, the electrophile is :
(A) $\cdot\text{CHO}$ (B) $\cdot\text{OH}$
(C) $\cdot\text{CCl}_2$ (D) CHCl_3

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32. Which one of the following is most reactive in cyanohydrin formation ?
(A) Acetophenone (B) p-Nitrobenzaldehyde
(C) Benzaldehyde (D) p-Methoxybenzaldehyde
33. Which metal is present in Vitamin B_{12} ?
(A) Cobalt (B) Magnesium
(C) Iron (D) Zinc
34. Hydrolysis of triglycerides by alkalis is known as :
(A) Mixed Hydrolysis (B) Combined Hydrolysis
(C) Saponification (D) Trans-Hydrolysis
35. Stereoisomers that are not mirror images of each other are called as :
(A) Cis-trans isomers (B) Atropisomers
(C) Enantiomers (D) Diastereomers
36. Isopropyl alcohol is the product of the reaction of Methylmagnesium iodide with :
(A) Propionaldehyde (B) Acetaldehyde
(C) Acetone (D) Propionic acid
37. The λ_{max} (nm) of  in UV spectrum is :
(A) 256 (B) 171
(C) 223 (D) 275
38. Wave number is represented by :
(A) δ (B) \AA°
(C) cm^{-1} (D) μm
39. K-band in UV spectrum refers to which one of the following transitions ?
(A) $\sigma \rightarrow \sigma^*$ (B) $n \rightarrow \pi^*$
(C) $n \rightarrow \sigma^*$ (D) $\pi \rightarrow \pi^*$
40. The range of IR spectrum (μm) is :
(A) 2.5 – 16 (B) 1.0 – 20
(C) 1.0 – 15 (D) 2.5 – 20

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41. The most common ore of copper is :

- (A) Haematite (B) Chalcopyrites
(C) Calamine (D) Galena

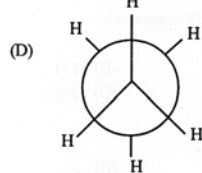
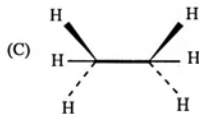
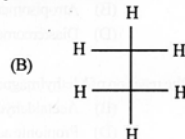
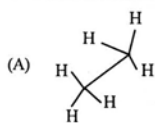
42. The integration ratio of methyl and phenyl protons of toluene in $^1\text{H-NMR}$ spectrum is :

- (A) 1 : 2 (B) 2 : 4
(C) 3 : 5 (D) 5 : 3

43. What is the tetrahedral bond angle ?

- (A) 120° (B) 115°
(C) 112° (D) 109.5°

44. Which one of the following is Sawhorse projection of ethane ?



45. IUPAC name of Isobutane is :

- (A) Ethyl ethane (B) 2-Methyl propane
(C) Methyl butane (D) Ethyl butane

46. $\text{R-X} + \text{Zn} + \text{H}^+ \rightarrow \text{Z}$

In the above reaction Z is :

- (A) R-Zn (B) R-ZnX
(C) R-R (D) R-H

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47. Halogenation of alkanes in the presence of light proceeds through which one of the following mechanisms ?

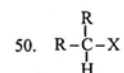
- (A) Electrophilic (B) Nucleophilic
(C) Free radical (D) Dipolar

48. Identify phenylethanal from the following :

- (A) $\text{Ph-CH}_2\text{-CHO}$ (B) Ph-CHO
(C) $\text{H}_3\text{C-C}_6\text{H}_4\text{-CHO}$ (D) $\text{H}_3\text{C-C}_6\text{H}_4\text{-CH}_2\text{-CHO}$

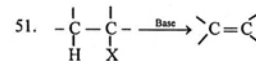
49. How many molecules of Phenyl hydrazine are required for the formation of Glucosazone from Glucose ?

- (A) 5 (B) 3
(C) 2 (D) 4



The above molecule belongs to which one of the following alkyl halides ?

- (A) Primary (B) Tertiary
(C) Quaternary (D) Secondary



The above reaction is called as :

- (A) Dehydration (B) Dehalogenation
(C) Dehydrohalogenation (D) Dehydrogenation

52. The reaction of an alkyl halide with sodium alkoxide to give ethers is known as :

- (A) Wolf-Kishner reaction (B) Cannizzaro reaction
(C) Williamson synthesis (D) Clemmenson reaction

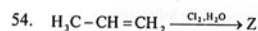
53. Addition of HBr to propene in the absence of peroxide catalyst yields :

- (A) 1-Bromopropane (B) 2-Bromopropane
(C) 1,1-Dibromopropane (D) 1,2-Dibromopropane

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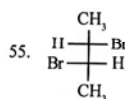
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The name of Z in the above reaction is :

- (A) 1-Chloro-2-propanol (B) 2-Chloro-1-propanol
(C) 1,2-Dichloropropane (D) 1,3-Dichloropropane



The configuration of this molecule is :

- (A) R, S (B) R, R
(C) S, R (D) S, S

56. 1-Hexyne can be prepared by the reaction of Lithium acetylide with :

- (A) n-Butyl bromide (B) t-Butyl bromide
(C) Isobutyl bromide (D) Neopentyl bromide



Z in the above reaction is :

- (A) $\text{C}_6\text{H}_5\text{CHCl}_2$ (B) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$
(C) $(\text{C}_6\text{H}_5)_3\text{CH}$ (D) $(\text{C}_6\text{H}_5)_2\text{CH}_2$

58. Which one of the following Vitamins plays an important role in Vision ?

- (A) B₁ (B) B₂
(C) C (D) A

59. Ascorbic acid is also known as Vitamin :

- (A) B₆ (B) C
(C) A (D) B₁₂

60. Naturally occurring high molecular weight polypeptides are called as :

- (A) Fats (B) Oils
(C) Vitamins (D) Proteins

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61. Average kinetic energy (KE) of molecules (gas) is :

- (A) $\text{KE} \propto T^\circ$ (Kelvin) (B) $\text{KE} \propto \frac{1}{T}$
(C) KE independent of T (D) $\text{KE} \propto$ Temperature in $^\circ\text{C}$

62. The kinetic energy for one mole of gas is :

- (A) $\frac{3}{2} RT$ (B) $\frac{2}{3} RT$
(C) $\frac{3}{2} KT$ (D) $\frac{2}{3} KT$

63. At what temperature the RMS velocity of SO_2 gas becomes equal to RMS velocity of O_2 molecule at 27°C ?

- (A) 54°C (B) 27°C
(C) 327°C (D) 327°K

64. The gas which has always the compressibility factor is greater than one :

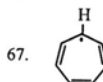
- (A) He (B) CH_4
(C) CO_2 (D) None

65. The units of Vanderwaal's constant 'b' are :

- (A) moles/litre (B) litres
(C) litres/moles (D) moles

66. The correct equation for corresponding states is :

- (A) $\left(\text{Pr} + \frac{3}{V_r^2}\right)(3V_r - 1) = 8T_r$ (B) $\left(\text{Pr} + \frac{1}{V_r^2}\right)(V_r - 1) = T_r$
(C) $\left(\text{Pr} + \frac{V_r^2}{3}\right)(3V_r - 1) = \frac{8}{T_r}$ (D) $\left(\text{Pr} + \frac{V_r^2}{3}\right)(1 - 3V_r) = 8T_r$



The name of this species is :

- (A) Cycloheptatrienyl cation (B) Cycloheptatrienyl anion
(C) Tropylium radical (D) Tropylium ion

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68. For monoatomic gases C_p/C_v ratio is :
 (A) 1.00 (B) 1.40
 (C) 2.00 (D) 1.66
69. For H_2 gas the C_p/C_v ratio is :
 (A) 1.0 (B) 8/6
 (C) 5/3 (D) 1.4
70. A closed system is one which can exchange with surrounding is :
 (A) Only energy (B) Only matter
 (C) Matter and energy (D) None
71. Kirchoff's equation gives the effect of $_{-}(X)_{-}$ on enthalpy of reaction. The X is :
 (A) Pressure (B) Temperature
 (C) Volume (D) Mass
72. Which of the following substance has μ_{JT} negative value ?
 (A) CO_2 (B) HCl
 (C) N_2 (D) He
73. The standard enthalpy of formation of H^+ ions at unity activity ($a = 1$) is :
 (A) Same as OH^- (B) > 0
 (C) < 0 (D) 0 (zero)
74. The reaction in which $\Delta \neq \Delta H$ is :
 (A) $CH_{4(g)} + 4F_{2(g)} \rightarrow CF_{4(g)} + 4HF_{(g)}$
 (B) $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$
 (C) $Na(s) + \frac{1}{2}F_{2(g)} \rightarrow NaF(s)$
 (D) $BaCl_2(aq) + K_2SO_4(aq) \rightarrow 2KCl(aq) + BaSO_4(s)$

75. In which one of the following reactions a β -ketoester is the product ?
 (A) Wittig (B) Aldol
 (C) Claisen (D) Ardan-Eistert
76. Which of the following is not state function in thermodynamics ?
 (A) Entropy (B) Enthalpy
 (C) Work (D) Free energy
77. Which of the following is true for equilibrium process ?
 (A) $\Delta G = 0$ (B) $\Delta H = -T\Delta S$
 (C) $\Delta G = +ve$ (D) $\Delta G = -ve$
78. Number of phases in equilibrium at triple point of water system are :
 (A) 3 (B) 0
 (C) 1 (D) 2
79. The maximum degrees of freedom for one component system are :
 (A) 1 (B) 2
 (C) 3 (D) 0
80. In a closed room the refrigerator door is kept open. The room :
 (A) cools (B) not affected
 (C) warms (D) can't be predicted
81. When alum is added to turbid water :
 (A) Sol particles are emulsified (B) Sol particles are coagulated
 (C) Sol particles are absorbed (D) Sol particles are dispersed
82. The cleaning action of soap is due to :
 (A) Emulsification of greasy dirt (B) Coagulation of dirt
 (C) Precipitation of dirt (D) Ionisation of soap solution
83. Blood is a :
 (A) Sol (B) Gel
 (C) Emulsion (D) Foam

84. Cold cream is a :
 (A) Gel (B) Emulsion
 (C) Sol (D) Not a colloid
85. In hydrophobic colloids, the coagulation is :
 (A) Reversible (B) Irreversible
 (C) Not occurs (D) May be reversible and irreversible
86. In the presence of co-enzymes, the catalytic activity of enzymes :
 (A) Not effected (B) Decreases
 (C) Increases (D) reaction stops
87. The energy of visible radiation in K.cals/mole is :
 (A) 71.5 – 35.7 (B) 143 – 71.5
 (C) 35.7 – 11.4 (D) 11.4 – 1.14
88. The method used to determine osmotic pressure is :
 (A) Beckmann method (B) Cottrell's method
 (C) Berkely-Hartley method (D) Lands burger method
89. For the n^{th} order reaction $t_{1/2}$ is proportional to :
 (A) $t_{1/2} \propto \frac{1}{a^n}$ (B) $t_{1/2} \propto a^n$
 (C) $t_{1/2} \propto \frac{1}{a^{n-1}}$ (D) $t_{1/2} \propto a^{n-1}$
90. Which of the following is a good conductor of current ?
 (A) Teflon (B) Glass
 (C) Graphite (D) Water
91. The units of a rate constant are $\text{mol}^{-1} \text{lit sec}^{-1}$. The order of the reaction is :
 (A) 0 (B) 1
 (C) 2 (D) 3

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92. The standard reduction potential of Pb, Cd, Ni and Zn are -0.13 V , -0.40 V , -0.25 V and -0.76 V respectively. Which of the following is true in solution ?
 (A) Zn replaces all other metals from their solutions
 (B) Cd replaces only Zn from ZnSO_4
 (C) Ni replaces Cd from CdSO_4
 (D) Pb replaces Cd from CdSO_4
93. The pH of $1 \times 10^{-4} \text{ M}$ HCl aqueous solution is :
 (A) 8 (B) >7
 (C) <7 (D) 7
94. The pK_a of acetic acid is 4.74. At half neutralisation of acetic acid its pH is :
 (A) 7.00 (B) 1.00
 (C) 4.74 (D) 2.37
95. The units of specific conductivity are :
 (A) Siemens (B) S^{-1}
 (C) Sm^{-1} (D) Mho cm
96. Ostwald dilution law is :
 (A) $K = \frac{C\alpha^2}{(1-\alpha)}$ (B) $K = \frac{\alpha^2}{(1-\alpha)C}$
 (C) $K = \frac{\alpha^2 v}{1-\alpha}$ (D) $K = \frac{C\alpha^2}{(1+\alpha)}$
97. One Faraday (1F) is equal to :
 (A) 9650 Coulombs (B) 965 Coulombs
 (C) 96500 Coulombs (D) 1000 Coulombs
98. Which of the following is most bad conductor of electricity ?
 (A) Pure water (B) Graphite
 (C) Molten NaCl (D) Hg metal
99. A cell in which electric current is produced by an oxidation-reduction process is called :
 (A) Voltaic cell (B) Reversible cell
 (C) Concentration cell (D) Electrolytic cell

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100. Increase of rate of reaction with increase in concentration of reactant is due to :
 (A) Decrease in E_a (B) Increase in E_a
 (C) Increase in free energy of reaction (D) Increase in number of fruitful collisions
101. The elements which occupy position in the periodic table just after the members of zero group are :
 (A) Alkaline earth metals (B) Alkali metals
 (C) Halogen family (D) Non metals
102. Which of the following is not a representative element ?
 (A) Fe (B) K
 (C) N (D) Ba
103. Protium has the molecular formula :
 (A) D_2 (B) T_2
 (C) HD (D) H_2
104. Which element has the atomic number 25 ?
 (A) Ti (B) Fe
 (C) Mn (D) V
105. The lanthanide element is :
 (A) Gd (B) U
 (C) Pt (D) Xe
106. The energy associated with the process $M^+_{(g)} \rightarrow M^{2+}_{(g)} + e^-$:
 (A) First ionization energy (B) Electron affinity
 (C) Third ionization energy (D) Second ionization energy
107. First ionization energies of C, N and O follows the order :
 (A) $C < N < O$ (B) $O > N > C$
 (C) $C < N > O$ (D) $C > N < O$
108. Electronegativity values of Fe, Fe^{2+} and Fe^{3+} are in the order :
 (A) $Fe > Fe^{2+} > Fe^{3+}$ (B) $Fe^{3+} > Fe^{2+} > Fe$
 (C) $Fe^{3+} > Fe > Fe^{2+}$ (D) $Fe^{2+} > Fe^{3+} > Fe$

109. Which one of the following ions has the largest size ?
 (A) Ne^+ (B) Li^+
 (C) Mg^{2+} (D) Rb^+
110. Which of the following has least electron-affinity ?
 (A) O (B) Ar
 (C) F (D) N
111. Which of the following is most penetrating ?
 (A) Gamma rays (B) Beta rays
 (C) Alpha particles (D) Neutrons
112. Balance the nuclear reaction $^{24}_{11}Na \rightarrow ^{24}_{12}Mg + \dots\dots\dots$
 (A) Neutron (B) α -particle
 (C) β -particle (D) Positron
113. The radio isotope used for the treatment of thyroid activity is :
 (A) ^{235}U (B) ^{13}C
 (C) ^{131}I (D) ^{60}Co
114. Balance the nuclear reaction $^{13}_7N \rightarrow ^{13}_6C + \dots\dots\dots$
 (A) α -particle (B) Neutron
 (C) β -particle (D) Positron
115. Atoms with the same atomic number but different numbers of neutrons :
 (A) Isobars (B) Isotones
 (C) Nuclear isomers (D) Isotopes
116. β -particle emission by a nucleus changes the mass number by number of units :
 (A) No change in mass number
 (B) Increases mass number
 (C) Decreases mass number
 (D) Both mass number and atomic number remains same
117. Bond order of H_2^+ is :
 (A) 1 (B) 0.5
 (C) zero (D) 2

118. Which one of the following free radicals is formed most readily ?

- (A) Vinyl (B) Benzyl
(C) Primary (D) Secondary

119. The number of Pi bonds in SO_2 molecule :

- (A) 2 (B) 1
(C) 4 (D) 0

120. The C_2H_2 molecule has the following type of bonds :

- (A) Three Pi (B) One Sigma and one Pi
(C) Two Sigma one Pi (D) One Sigma and Two Pi