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PG-EE-2013
SUBJECT : Chemistry

A

11393

Sr. No.

Time : 1¼ Hours

Max. Marks : 100

Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Father's Name _____

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SEAL

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PG-EE-2013/Chemistry/(A)

- C = C frequency in Oct-4-ene appears at :
 - 1680-1600 cm^{-1} (very weak)
 - 1680-1600 cm^{-1} (strong)
 - 1680-1600 cm^{-1} (m)
 - No peak in this region of 1680-1600 cm^{-1}
- I for C-13 is :
 - 1
 - 1/2
 - 3/2
 - 2
- I for P-31 is :
 - 1
 - 1/2
 - 3/2
 - 3
- What is the right order of coupling constants ?
 - $J^1 > J^2 > J^3$
 - $J^3 > J^2 > J^1$
 - $J^1 = J^2 = J^3$
 - None of these
- Which aromatic band shows fine structure ?
 - Primary
 - Secondary
 - Tertiary
 - None
- Which is a better Diels Alder Diene for reaction with maleic anhydride ?
 - Furan
 - Pyrrole
 - Thiophene
 - Pyridine
- Which is a strong base ?
 - Aniline
 - Cyclohexylamine
 - Pyrrole
 - Quinoline
- Which is the right decreasing order of nucleophilicity ?
 - $\text{CH}_3 - \overset{\ominus}{\text{C}}\text{H}_2 > \overset{\ominus}{\text{N}}\text{H}_2 > \text{CH} \equiv \overset{\ominus}{\text{C}} > \overset{\ominus}{\text{O}}\text{H}$
 - $\text{CH} \equiv \overset{\ominus}{\text{C}} > \overset{\ominus}{\text{N}}\text{H}_2 > \text{CH} \equiv \overset{\ominus}{\text{C}} > \overset{\ominus}{\text{O}}\text{H}$
 - $\overset{\ominus}{\text{O}}\text{H} > \overset{\ominus}{\text{N}}\text{H}_2 > \text{CH} \equiv \overset{\ominus}{\text{C}} > \text{CH}_3 - \overset{\ominus}{\text{C}}\text{H}_2$
 - $\overset{\ominus}{\text{N}}\text{H}_2 > \text{CH} \equiv \overset{\ominus}{\text{C}} > \overset{\ominus}{\text{O}}\text{H} > \text{CH}_3 - \overset{\ominus}{\text{C}}\text{H}_2$

9. Which gives single mononitroderivative ?
(1) Naphthalene (2) O-xylene (3) Ethylbenzene (4) p-xylene
10. Which one is most effective in an SN^2 displacement on methyl bromide ?
(1) $C_2H_5O^-$ (2) HO^- (3) $C_6H_5O^-$ (4) CH_3COO^-
11. Which reacts fastest with N-bromosuccinimide (NBS) ?
(1) Toluene (2) Methane (3) Pyridine (4) Benzene
12. When vinyl cyanide reacts with ethylalcohol in presence of a base, what is formed ?
(1) $CH_2 = CH - OH$ (2) $C_2H_5O - CH_2 - CH_2CN$
(3) CH_3CH_2OH (4) $C_2H_5 - O - C_2H_5$
13. Which is the best leaving group ?
(1) Chloride (2) Fluoride (3) Tosylate (4) None
14. With cis-alkenes, the triplet carbenes give :
(1) cis-product (2) trans-product
(3) no product (4) both cis and trans products
15. DNFB is used to identify N-terminal amino acid of peptides. The reagent is called :
(1) Van-Slyke reagent (2) Sorenson reagent
(3) Sanger's reagent (4) Stephens reagent
16. Continuous wave NMR spectroscopy involves :
(1) sequential detection of resonances of nuclei
(2) simultaneous detection of all resonances of nuclei
(3) sometimes sequential and sometimes simultaneous detection of nuclei
(4) None

17. The addition of Br_2 to methyl acetylene to give trans-1, 2-dibromopropene is a :
- (1) Stereoselective reaction
 - (2) Stereospecific reaction
 - (3) Stereoselective and Stereospecific reaction
 - (4) None
18. The reagent used in Edman degradation for N-terminal group analysis of peptides is :
- (1) Phenyl isothiocyanate
 - (2) Benzylchloroformate
 - (3) DNFB
 - (4) Di-t-butyl carbonate
19. Aspartic acid shows :
- (1) pK_{a1}
 - (2) pK_{a2}
 - (3) pK_{a1} and pK_{a2}
 - (4) pK_{a1} , pK_{a2} and pK_{a3}
20. Which is incorrect about grading of sugars ?
- (1) Sucrose-1
 - (2) Fructose-1.75
 - (3) Lactose-6
 - (4) Saccharin-3500
21. Which is a local anaesthetic ?
- (1) Cocaine
 - (2) Quinine
 - (3) Morphine
 - (4) None
22. Which enhances the absorption of Vitamin A ?
- (1) Vit. K
 - (2) Vit. C
 - (3) DMG
 - (4) None
23. By which of the following reaction, acetophenone can be converted to phenol ?
- (1) m-CPBA followed by base catalyzed hydrolysis
 - (2) Conc. HNO_3
 - (3) Iodine and $NaOH$
 - (4) Singlet oxygen followed by hydrolysis
24. Diazomethane with acetylene gives :
- (1) Pyrazole
 - (2) Pyrazoline
 - (3) Piperidine
 - (4) Pyrimidine

25. Cinnamoyl alcohol with lead tetraacetate gives :
- (1) Cinnamic acid (2) Cinnamoyl acetate
(3) Cinnamaldehyde (4) Acetophenone
26. Betaine is an intermediate in :
- (1) Wittig reaction (2) Stobbe reaction
(3) Stephenson reduction (4) MPV reduction
27. If the migrating group in Beckman rearrangement is chiral, then :
- (1) Its configuration will change
(2) Its configuration will be retained
(3) Both
(4) None
28. Which reduces only the carbonyl group in the presence of nitro, carboxyl, double bond and ester functional groups ?
- (1) LAH (2) Na/NH₃ (3) NaBH₄ (4) H₂/Ni
29. Which is the correct decreasing order of reactivity towards electrophilic aromatic substitution ?
- (1) Indole > Pyrrole > Pyridine (2) Pyrrole > Pyridine > Indole
(3) Pyrrole > Indole > Pyridine (4) Indole > Pyridine > Pyrrole
30. OH signal of alcohol appears at what ppm range ?
- (1) 0.5 – 5.0 (2) 0.1 – 8.0 (3) 0.3 – 4.0 (4) 0.3 – 10.0
31. What is the decreasing order of chemical shifts for protons among these ?
- (1) Alkynes > Alkanes > Alkenes (2) Alkanes > Alkenes > Alkynes
(3) Alkynes > Alkenes > Alkanes (4) Alkenes > Alkynes > Alkanes

32. The singlet at about 4.0 ppm in the proton NMR spectrum of methylacetate is due to which protons ?
- (1) Methyl (2) Methoxy
(3) Methyl and Methoxy (4) None of these
33. Which is *not* an anti-cancer drug ?
- (1) Vincristine (2) Cyclophosphamide
(3) Doxorubicin (4) Gabapentin
34. Hexene-1 after reaction with metachloro-perbenzoic acid followed by treatment with lithium aluminium hydride and then with water in acidic medium gives :
- (1) Hexane (2) Hexan-1-ol (3) Hexan-2-ol (4) None
35. Write the symbol of atomic orbital if $n = 3, l = 2$ and $m = -2, -1, 0, +1, +2$:
- (1) 2s (2) 3s (3) 3p (4) 3d
36. An element with atomic number 72 belongs to :
- (1) s-block (2) p-block (3) d-block (4) f-block
37. Which of the following metals has lowest ionization potential ?
- (1) Lithium (2) Sodium (3) Beryllium (4) Magnesium
38. Which cation has highest polarizing power ?
- (1) Na^+ (2) Mg^{2+} (3) K^+ (4) Al^{3+}
39. How many lone pairs of electrons are present in ICl_2^- ion ?
- (1) Zero (2) One (3) Two (4) Three
40. Which of the following molecules/ions has smallest O - O bond ?
- (1) O_2 (2) O_2^+ (3) O_2^- (4) O_2^{2-}
41. In Rutile structure, the coordination number of Titanium atoms is :
- (1) Six (2) Four (3) Two (4) Eight

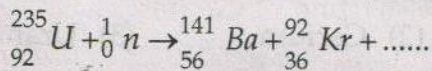
42. Which of the following metal ion pairs have similar ionic radii ?
- (1) Ti^{4+} and Zr^{4+} (2) V^{5+} and Nb^{5+}
(3) Cr^{3+} and Mn^{3+} (4) Zr^{4+} and Hf^{4+}
43. Which of the following solid will behave as p-type semiconductor ?
- (1) $NaCl$ (2) ZnS (3) FeS (4) $AgCl$
44. Which metal has highest cohesion energy ?
- (1) Cobalt (2) Nickel (3) Copper (4) Zinc
45. The aqueous solution of which metal ion will be colourless ?
- (1) Ti^{3+} (2) Cr^{3+} (3) Cu^+ (4) Cu^{2+}
46. Which of the following is a Lanthanide element ?
- (1) Francium (2) Europium (3) Tungsten (4) Polonium
47. In the reaction $HClO_4 + HF \rightleftharpoons H_2F^+ + ClO_4^-$, the base is :
- (1) $HClO_4$ (2) HF (3) H_2F^+ (4) ClO_4^-
48. Which of the following will behave as a Lewis acid ?
- (1) NH_3 (2) NH_4^+ (3) BF_3 (4) CH_4
49. If you titrate an aqueous solution of borax with HCl , indicator used will be :
- (1) Phenolphthalein (2) Methyl orange
(3) Methyl red (4) Eriochrome black T
50. As per HSAB concept, the hardest acid will be :
- (1) Fe^{3+} (2) Zn^{2+} (3) Ag^+ (4) Hg^{2+}
51. Which of the Halogens is strongest oxidizing agent in water ?
- (1) F_2 (2) Cl_2 (3) Br_2 (4) I_2
52. Which of the oxides is most acidic in nature ?
- (1) CO (2) CO_2 (3) N_2O_5 (4) SO_3

53. Which of the following is most stable ?
(1) Ce^{2+} (2) Eu^{2+} (3) Sm^{2+} (4) Pr^{2+}
54. Pitchblende is an Ore of :
(1) Lanthanum (2) Cerium (3) Uranium (4) Thorium
55. How many Isomers are possible for the complex $K_2[Pt(NH_3)_4Cl_2]$?
(1) One (2) Two (3) Four (4) Six
56. What is the spin only magnetic moment of $[Fe(CN)_6]^{3-}$ ion ?
(1) 5.92 (2) 4.90 (3) 2.83 (4) 1.73
57. Which of high spin octahedral complex will show tetragonal distortion ?
(1) d^3 (2) d^4 (3) d^5 (4) d^8
58. How many unpaired electrons are present in $[CoF_6]^{3-}$ ion ?
(1) Zero (2) One (3) Two (4) Four
59. Predict the type of isomerism in $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$:
(1) Linkage Isomerism (2) Coordination Isomerism
(3) Stereoisomerism (4) Coordination position Isomerism
60. Which of the following complex ions will not be square planar in structure ?
(1) $[Co(CN)_4]^{2-}$ (2) $[Ni(CN)_4]^{2-}$ (3) $[Cu(NH_3)_4]^{2+}$ (4) $Ni(CO)_4$
61. How many peaks are observed in UV-visible absorption spectra of $[Ni(H_2O)_6]^{2+}$?
(1) One (2) Two (3) Three (4) Four
62. Write the Ground Term of Cr^{3+} :
(1) $6s$ (2) $4f$ (3) $2D$ (4) $3p$
63. Predict the Point Group in $Fe(CO)_5$:
(1) O_h (2) C_{3v} (3) C_{2v} (4) D_{3h}
64. Nitrogenase enzyme consists of :
(1) Co (2) Se (3) Mo, Fe (4) Mg

65. Vitamin B_{12} consists of :

- (1) Fe (2) Co (3) Mn (4) V

66. Complete the reaction :



- (1) $2 {}_0^1\text{n}$ (2) ${}_1^1\text{H}$ (3) ${}_1^2\text{H}$ (4) ${}_2^4\text{He}$

67. Bhopal Tragedy which killed thousands of people, was due to air pollution of :

- (1) CO (2) SO_2
(3) Nitrogen oxides (4) Methyl Isocyanate

68. The cartesian components of angular momentum in a direction parallel to x-axis is given by :

- (1) $\hat{L}_x = i\hbar \left[x \cdot \frac{\partial}{\partial x} - z \cdot \frac{\partial}{\partial z} \right]$ (2) $-i\hbar \left[y \cdot \frac{\partial}{\partial z} - z \cdot \frac{\partial}{\partial y} \right]$
(3) $\hat{L}_x = i\hbar \left[y \cdot \frac{\partial}{\partial z} - z \cdot \frac{\partial}{\partial y} \right]$ (4) $-i\hbar \left[x \cdot \frac{\partial}{\partial z} - z \cdot \frac{\partial}{\partial x} \right]$

69. Operators \hat{A} and \hat{B} are said to be commutative, if :

- (1) $\hat{A} - \hat{B} = 0$ (2) $\hat{A} + \hat{B} = 0$
(3) $\hat{A}\hat{B} - \hat{B}\hat{A} = 0$ (4) $\hat{A}\hat{B} + \hat{B}\hat{A} = 0$

70. The wave function for a particle in one dimensional box is expressed as :

- (1) $\frac{\sqrt{2}}{a} \sin \frac{n\pi x}{a}$ (2) $\sqrt{\frac{2}{a}} \frac{n\pi x}{a}$ (3) $\sqrt{\frac{2}{a}} \sin \frac{\pi x}{a}$ (4) $\sqrt{\frac{2}{a}} \sin \frac{n\pi x}{a}$

71. The Boyle temperature is that at which the second virial coefficient of real gas is :

- (1) zero (2) one (3) four (4) one and half

72. The fugacity function is defined as :

- (1) $\lim_{P \rightarrow 0} \frac{p}{f} = 1$ (2) $\lim_{P \rightarrow 0} \frac{f}{p} = 1$ (3) $\lim_{f \rightarrow 0} \frac{p}{f} = 1$ (4) $\lim_{P \rightarrow 0} \frac{p}{f} = 0$

73. Choose the correct relation :

(1) $(\partial A / \partial T)_p = \left(\frac{\partial G}{\partial T}\right)_V$

(2) $\left(\frac{\partial A}{\partial T}\right)_V = \left(\frac{\partial G}{\partial T}\right)_P$

(3) $\left(\frac{\partial T}{\partial S}\right)_P = \left(\frac{\partial V}{\partial S}\right)_P$

(4) $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial T}{\partial V}\right)_P$

74. For the combustion of one mole of $\text{CH}_3\text{COOH}(l)$ at 298 K, Δn is :

(1) 1

(2) -1

(3) zero

(4) -1/2

75. In the limit $T \rightarrow 0$, for a crystal :

(1) $S_T = 3C_p$

(2) $S_T = 2C_p$

(3) $S_T = C_p/2$

(4) $S_T = C_p/3$

where C_p is the heat capacity at constant pressure.

76. The compressibility factors of Vander Waal gas at critical point is :

(1) 0.375

(2) 0.400

(3) zero

(4) 0.512

77. The Joule-Thomson expansion of an ideal gas is :

(1) Adiabatic process

(2) an isentropic process

(3) an isenthalpic process

(4) an isothermal process

78. The spacing between 123 planes in an orthorhombic unit cells having $a = 50$ pm, $b = 100$ pm and $c = 150$ pm is :

(1) 2.9 pm

(2) 29 pm

(3) 9.2 pm

(4) 92 pm

79. The cell potential is a :

(1) Colligative property

(2) Thermodynamic property

(3) Intensive property

(4) Extensive property

80. The solubility of silver chloride in water at 298.15 K is 0.00179 g litre⁻¹. The solubility product will be :

(1) $156 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$

(2) $1.56 \times 10^{-9} \text{ mol}^2 \text{ dm}^{-6}$

(3) $15.6 \times 10^{-12} \text{ mol}^2 \text{ dm}^{-6}$

(4) $1.56 \times 10^{-10} \text{ mol}^2 \text{ dm}^{-6}$

81. In the lead acid battery during charging, the cathode reaction is :
(1) reduction of Pb^{+2} to Pb (2) formation of $PbSO_4$
(3) formation of PbO_2 (4) None of these
82. When a radioactive element loses one ' α ' and two ' β ' particles, it yields :
(1) Isobar (2) Isomer (3) Isotope (4) Allotrope
83. 50 ml of 0.1 $NaOH$ are added to 49 ml of 0.1 HCl . The pH of the resulting solution is :
(1) 12 (2) 11 (3) 10 (4) 9
84. The heat of reaction is independent of :
(1) Pressure (2) Temperature
(3) Physical state (4) The path by which product is formed
85. Which of the following will show ESR spectra ?
(1) C_6H_6 (2) CH_3 (3) CH_4 (4) H_2
86. What is the frequency of radiation possessing wave length 400 nm ?
(1) $7.5 \times 10^{-14} S^{-1}$ (2) $7.5 \times 10^{14} S^{-1}$ (3) $7.5 \times 10^9 S^{-1}$ (4) $7.5 \times 10^{-13} S^{-1}$
87. In aerosol, the dispersion medium is :
(1) Gas (2) Solid (3) Liquid (4) Mixture of all
88. The polymers consist of coil like polymer chain are :
(1) Thermoplasts (2) Elastomers (3) Thermosets (4) None of these
89. Which of the following is a state function ?
(1) $E - PV$ (2) $E + PV$ (3) Q/W (4) $Q - W$
90. The ilkovic equation for diffusion current is expressed as :
(1) $\vec{I}_d = 607nDC m^{2/3} t^{1/6}$ (2) $\vec{I}_d = 607nD^{1/2}C m^{2/3} t^{1/6}$
(3) $\vec{I}_d = 607nC D^{1/2} m^{2/3} t^{1/6}$ (4) $\vec{I}_d = 607nD^{1/2}C^{1/2} m^{1/3} t^{1/6}$

91. The force constant of a diatomic S.H.O. can be calculated by employing relation :

- (1) $k = 4\pi^2 c^2 (\bar{\nu}^2) \mu$ (2) $k = 4\pi^2 c (\bar{\nu}^2) \mu$
(3) $k = 4\pi^2 c (\bar{\nu}) \mu^2$ (4) $k = 4\pi^2 \mu c$

where all the symbols have their usual meaning.

92. Zero point energy for diatomic molecule possessing harmonic motion is :

- (1) zero (2) $h\nu$ (3) $\frac{1}{2} h\nu$ (4) $\frac{1}{3} h\nu$

93. The power output of a laser in which 2.0 J pulse can be delivered in one nanosecond is :

- (1) 2.0 GW (2) 20.0 GW (3) 0.20 GW (4) None of these

94. For Arrhenius equation, $A = e^{-E_a/RT}$, if $T \rightarrow \infty$, then value of E_a will be :

- (1) positive (2) negative (3) zero (4) equal to A

95. The molarity of pure water is :

- (1) 50 (2) 18 (3) 100 (4) 55.6

96. The degeneracy of the rotational energy level with $J = 4$ for a heterodiatomic molecule is :

- (1) 4 (2) 7 (3) 9 (4) 8

97. Mean free path of a gas molecule is :

- (1) inversely proportional to pressure
(2) directly proportional to pressure
(3) independent of pressure
(4) independent of temperature

98. In B.E.T. equation one of the following statement is *not* true. Select the one :

- (1) It considers the multi-layer adsorption
(2) It doesn't use the concept of saturation of vapour pressure
(3) It is not valid for porous adsorbent
(4) It uses the concept of latent heat of condensation

99. No diffraction would result, if :

- (1) $\lambda \ll 2d$ (2) $\lambda \approx 2d$ (3) $\lambda < d$ (4) $\lambda \gg 2d$

100. $11.2 \times 10^3 \text{ m}^3$ of a gas at STP requires 104.6 J to raise its temperature by 10 degree. The C_v for the gas is :

- (1) $20.92 \text{ J deg}^{-1} \text{ mole}^{-1}$ (2) $10.46 \text{ J deg}^{-1} \text{ mole}^{-1}$
(3) $9.4 \text{ J deg}^{-1} \text{ mole}^{-1}$ (4) zero