(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2019 (Chemistry)-(SET-X)

10357

A

Sr. No. ....

Time : 1½ Hours   Total Questions : 100   Max. Marks : 100

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

Candidate's Name _____ Date of Birth_____

Father's Name _____ Mother's Name_____

Date of Exam : _____

_____   _____
(Signature of the Candidate)   (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are **compulsory** and carry equal marks. The candidates are required to attempt all questions.

2. The candidate **must return** this question booklet and the OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along-with answer key of all the A, B, C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.

6. *Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.*

7. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ Mark (0.25 Mark) discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

8. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

CPG-EE-2019(Chemistry)-(SET-X)/(A)

SEAT

1. Which of the following has least de-Broglie wavelength ?

   (1) e^- (2) p (3) CO_2 (4) SO_2

2. The geometry of AsF_5 is :

   (1) Pyramidal   (2) Tetrahedral

   (3) Trigonal bipyramidal   (4) Octahedral

3. The effective nuclear charge at the periphery of Cr atom, using slater rule is :

   (1) 3.35   (2) 3.70   (3) 1.70   (4) 2.60

4. The theoretical value of magnetic moment of Gd^{3+} is :

   (1) 7.94   (2) 9.72   (3) 9.57   (4) 7.63

5. Which of the following will **not** show H-bonding ?

   (1) HF (2) NH_3 (3) H_2O (4) CH_4

6. The oxide which gives H_2O_2 on treatment with dilute acid is :

   (1) PbO_2 (2) Na_2O_2 (3) MnO_2 (4) TiO_2

7. Inorganic benzene is :

   (1) BH_3OH_3 (2) $B_3N_3H_6$

   (3) B_2H_6 (4) B_4H_{10}

8. The correct order of increasing size is :

   (1) $Na^+ < Li^+ < Be^{2+} < B^{3+}$ (2) $B^{3+} < Be^{2+} < Li^+ < Na^+$

   (3) $Be^{2+} < B^{3+} < Na^+ < Li^+$ (4) $Li^+ < Na^+ < B^{3+} < Be^{2+}$

9. Addition of As in trace amounts to pure Ge will result in the formation of :

   (1) n-type semiconductor   (2) Germanium arsenic

   (3) p-type semiconductor   (4) Super conducting-alloy

10. Freon is :

    (1) CCl_3H (2) CF_4

    (3) CF_3H_3 (4) CCl_2F_2

11. The aqueous solution of which of the following has maximum pH ?

    (1) $NaClO$

    (2) $NaClO_2$

    (3) $NaClO_3$

    (4) $NaClO_4$

12. Which one of the following compounds will exhibit linkage isomerism ?

    (1) $[Pt(NH_3)_2 Cl_2]$

    (2) $[Co(NH_3)_5 NO_2]Cl_2$

    (3) $[Co(NH_3)_4 Cl_2]Cl$

    (4) $[Co(en)_2 Cl_2]Cl_2$

13. Which oxide of vanadium is most likely to be basic and ionic ?

    (1) VO

    (2) V_2O_3

    (3) VO_2

    (4) V_2O_5

14. Which of the following complex is non-ionisable ?

    (1) $CoCl_3 . 6NH_3$

    (2) $CoCl_3 . 5NH_3$

    (3) $CoCl_3 . 4NH_3$

    (4) $CoCl_3 . 3NH_3$

15. EAN (Effective Atomic No.) of Fe^{2+} ion in $[Fe^{2+}(CN_6)]^{4-}$ is equal to :

    (1) 26

    (2) 36

    (3) 18

    (4) 54

16. Which is used in cancer chemotherapy ?

    (1) Zeise's salt

    (2) Auranofin

    (3) Cisplatin

    (4) None

17. Which pairing is **wrong** ?

    (1) $[Fe(H_2O)_6]^{2+}$ – Paramagnetic

    (2) $[Fe(CN)_6]^{4-}$ – Paramagnetic

    (3) $[CoF_6]^{3-}$ – Paramagnetic

    (4) $Ni(CO)_4$ – Diamagnetic

18. Formula of pitch blende is :

    (1) UO_2

    (2) U_3O_8

    (3) UF_4

    (4) None of these

19. Which one of the following is the best method of preparation of acetophenone ?

    (1) $PhCOOEt + CH_3MgBr \rightarrow$

    (2) $PhCOCl + CH_3MgBr \rightarrow$

    (3) $PhCONH_2 + CH_3MgBr \rightarrow$

    (4) $PhCN + CH_3MgBr \rightarrow$

20. Dilute HCl is used to separate following radical :

    (1) Ag^+ (2) Ca^{2+} (3) Sn^{2+} (4) Ba^{2+}

21. Wilson disease is caused by the excess of :

    (1) Zinc   (2) Copper   (3) Magnesium   (4) Lead

22. In the compound $Fe_4[Fe(CN)_6]$ the respective oxidation states of Fe are :

    (1) II, III   (2) II, II   (3) III, II   (4) III, III

23. In vitro reaction of excess of O_2 with free heme B in aqueous medium, end product is :

    (1) Hematin

    (2) Heme B CO_2

    (3) $[O_2^- -Fe(III) - \text{protoporphyrin} - IX]$

    (4) All of these

24. The main reason for larger number of oxidation states exhibited by the actinoids than the corresponding lanthanoids is :

    (1) More energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

    (2) Lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

    (3) Larger atomic size of actinoids than the lanthanoids.

    (4) Greater reactive nature of actinoids than the lanthanoids.

25. Which of the following has zero dipole moment ?

    (1) ClF (2) PCl_3 (3) SiF_4 (4) $CFCl_3$

26. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is :

    (Atomic Nos. Y = 39, La = 57, Eu = 63, Lu = 71)

    (1) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (2) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

    (3) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (4) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

27. $AgCl$ is soluble in ammonia due to the formation of :

    (1) $Ag(NH_2)Cl$ (2) $[Ag(NH_3)_2]Cl$ (3) $AgNH_2$ (4) $NH_4[AgCl(NH)_2]$

28. Hydrogen directly combines with :

    (1) Au (2) Cu (3) Ni (4) Ca

29. Which is used in filling cavities in teeth ?

    (1) $Cu\,(Hg)$ (2) $Ag\,(Hg)$ (3) $Zn\,(Hg)$ (4) $Ni\,(Hg)$

30. Mg^{2+} is prepared in photosynthesis by chlorophyll because :

    (1) It has strong spin-orbit coupling

    (2) It has weak spin-orbit coupling

    (3) It is a heavy metal

    (4) It binds strongly with chlorophyll

31. In synthesis of Grignards reagent, alkyl halide reacts with Mg in presence of :

    (1) An ester   (2) Dry ether   (3) Alcohol   (4) Amide

32. The strongest acidic strength is that of :

    (1) C_2H_5OH (2) H_2O (3) HCN (4) Cl_3CCOOH

33. In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?

    (1) PCl_5 (2) SF_4 (3) I_3^- (4) $SbCl_5^{2-}$

34. The Compton wave length of an electron, λ_c is expressed as :

    (1) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{m}$ (2) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{2m}$ (3) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{mc}$ (4) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{mc}$

35. If $\hat{A}$ and $\hat{B}$ are two operators such that $[\hat{A}, \hat{B}] = 1$, then value of $[\hat{A}, \hat{B}^2]$ is :

    (1) $\hat{B}$ (2) $2\hat{B}$ (3) $\hat{A}$ (4) $2\hat{A}$

36. Which one of the following is *correct* relation ?

(1) $S = Rln W$

(2) $S = kln W$ ·

(3) $C_p = \left(\dfrac{\partial H}{\partial T}\right)_V$

(4) $C_v = \left(\dfrac{\partial E}{\partial T}\right)_P$

(All the symbols have their usual meanings.)

37. The degrees of freedom present in the system comprised of a gas in equilibrium with its solution in liquid will be :

(1) 2   (2) 1   (3) 3   (4) None of these

38. Polydispersity Index (PDI) of a polymer molecular is expressed as :

(1) $\dfrac{M_w}{M_n}$ (2) $\dfrac{M_n}{M_w}$ (3) $M_w \times M_n$ (4) $M_w + M_n$

Where M_w and M_n are mass-average molar mass and number-average molar mass of a polymer sample.

39. The radius of $_{13}^{27}Al$ nucleous is :

(1) 4.5×10^{-14} m

(2) 4.5×10^{-15} m

(3) 4.5×10^{-13} m

(4) 4.5×10^{-16} m

40. The temperature at which the virial coefficient of a real gas is zero is called :

(1) Boiling point

(2) Eutectic point

(3) Boyle temperature

(4) Critical temperature

41. The internal pressure of an ideal gas is :

(1) zero   (2) infinite   (3) 1   (4) None of these

42. The standard state for a solid is :

(1) Pure state of the solid at one atmospheric pressure

(2) Pure state of the solid at one atmospheric pressure and 273 K temperature

(3) Pure state of the solid at one atmospheric pressure and 298 K temperature

(4) Pure state of the solid at one atmospheric pressure at any given temperature

43. The Millar indices of crystal planes cut through the crystal axis at $(2a, 3b, c)$ are :

   (1) (1 2 2)   (2) (2 3 6)   (3) (6 3 2)   (4) (3 2 6)

44. Which one of the following statements is **true** ?

   (1) Work is a state function.

   (2) Entropies are additive and probabilities are multiplicative.

   (3) Entropies are multiplicative and probabilities are additive.

   (4) The entropy possessed by substance at 298 K is called residual Entropy.

45. A liquid is in equilibrium with its vapours at its boiling point. The molecules in the two phases have the same :

   (1) Chemical potential   (2) Enthalpy

   (3) Entropy   (4) None of these

46. In which of the following reactions, the collision theory of reactions rate is valid ?

   (1) Reaction between two diatomic molecules

   (2) Reaction between an atom and a diatomic molecule

   (3) Reaction between two complex molecules

   (4) Reaction between two atoms

47. The cell potential is a/an :

   (1) Colligative property   (2) Thermodynamic property

   (3) Extensive property   (4) Intensive property

48. For an isentropic change of state :

   (1) $dS = 0$ (2) $dS = 1$ (3) $dH = 0$ (4) None of these

49. Isotonic solutions have same :

   (1) Viscosity   (2) Surface tension

   (3) Freezing point   (4) Osmotic pressure

50. The rotational spectrum of a rigid diatomic rotator is comprised of equally spaced lines with spacing equal to :

(1) B (2) $2B$ (3) $2.5B$ (4) $3B$

51. The critical temperature of a liquid having boiling point 73°C is :

(1) 246°C   (2) 219°C   (3) 182°C   (4) None of these

52. Which of the following will show an ESR spectrum ?

(1) Cu^+ ion   (2) N_2 molecule   (3) Cu^{2+} ion   (4) CH_4 molecule

53. The ESR spectrum could be used to map molecular orbital by unpaired electron, which is aided by McConnel equation. The said equation is :

(1) $Q = a\rho$ (2) $Q = a + \rho$ (3) $a = Q\rho$ (4) $Q = a - \rho$

where ρ is the unpaired electron density on carbon atom and a is hyperfine splitting constant.

54. The molecule which is IR inactive and Raman active is :

(1) Protein   (2) HCl (3) SO_2 (4) N_2

55. The pH of an aqueous solution of 1×10^{-7} M HCl is :

(1) 7   (2) slightly less than 7

(3) slightly higher than 7   (4) none of these

56. When a beam of light is passed through a colloidal solution, it suffers :

(1) Reflection   (2) Refraction   (3) Scattering   (4) All of these

57. Dry ice is used in fire extinguishers. It is stored in solid form in the cylinder. When sprayed on a fire, it quickly changes into gas called CO_2. The change of state is known as :

(1) Sublimation   (2) Evaporation

(3) Condensation   (4) Distillation

A

58. Milk is a/an :

(1) Suspension   (2) Pure solution   (3) Gel   (4) Emulsion

59. The IR absorption at 1665 cm^{-1} in salicylic acid is due to :

(1) C – H bending   (2) O – H stretching

(3) C = O stretching   (4) O – H bending

60. Strong covalent bonds exist between polymer chains in :

(1) Elastomers   (2) Thermoplasts   (3) Thermosets   (4) All polymers

61. Which of the following statements about tetramethylsilane is **incorrect** ?

(1) It is Inert

(2) It is used to provide a reference against which other peaks are measured

(3) It is volatile and can be easily distilled off and used again

(4) It produces a single peak at $\delta = 10$

62. The ionic strength of 0.25 molal K_2SO_4 solution will be :

(1) 0.25   (2) 0.50   (3) 0.75   (4) 0.60

63. Debye-Hückel limiting law equation relates :-

(1) Activity coefficient with ionic strength of the solution

(2) Mean ionic coefficient with ionic strength of the solution

(3) Activity coefficient with square of the ionic strength of the solution

(4) None of these

64. 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

65. In the phenomenon of Larmor pression, the angular frequency of pression, "Larmor frequency" is expressed as :

    (1) $w = r + B_z$ (2) $w = r - B_z$ (3) $w = r / B_z$ (4) $w = rB_z$

    where $r = \dfrac{\mu}{I(h/2\pi)}$ and all the notations have usual meanings.

66. Which of the following relations represent Clasius-Claypeyron equation ?

    (1) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = -\dfrac{H}{T^2}$

    (2) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = H$

    (3) $\dfrac{\partial}{\partial T} \ln k_P = \dfrac{\Delta H°}{RT^2}$

    (4) $\dfrac{\partial}{\partial T} \ln P = \dfrac{\Delta H°_{vaporization}}{RT^2}$

67. Which of the following reaction involves rearrangement of nitrogen yields ?

    (1) Wittig reaction

    (2) Von-Richter reaction

    (3) Sommlet-Hauser reaction

    (4) Pinacol-Pinacolone rearrangement

68. Following pair of compounds are :
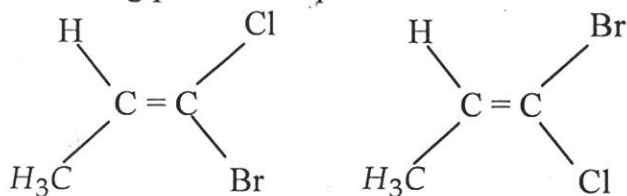
    (1) Enantiomers

    (2) Diastereomers

    (3) Geometrical isomers

    (4) Homomers

69. Absolute configuration of :
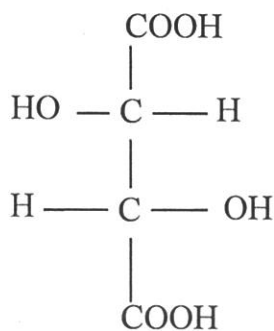
    (1) 2S, 3S   (2) 2R, 3R   (3) 2S, 3R   (4) 2R, 3S

70. Which among the following reagents gives syn addition with alkenes :

I Br_2

II   Dil $KMnO_4 / {}^-OH$

III $OSO_4 / NaSO_3H / H_2O$

IV $H_2 / Ni / \Delta$
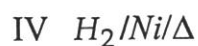
Select the answer from the codes given below :

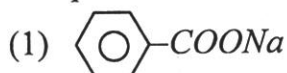(1) Only I   (2) II and III   (3) II, III and IV   (4) Only IV

71. Which of the following compounds shows a sharp IR absorption band at 1700 cm^{-1} and a broad band at 3300 cm^{-1} ?
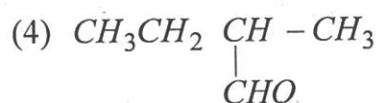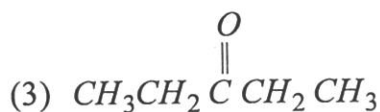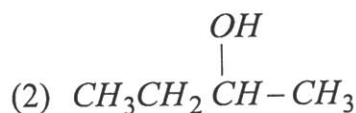
(1) Ethanol

(2) Ethanoic acid

(3) Propanone

(4) Diethyl ether

72. A signal in NMR appears at 30Hz on a 60 MHz instrument. Same signal on a 400 MHz instrument will appear at :

(1) 30 Hz   (2) 90 Hz   (3) 200 Hz   (4) 400 Hz

73. ⟨O⟩-COCl $\xrightarrow{H_2 / Pd. BaSO_4}$ A $\xrightarrow{NaOH}$ Product

The product in the reaction is :

(1) ⟨O⟩-COONa

(2) ⟨O⟩-CHO

(3) ⟨O⟩-CH₂OH

(4) ⟨O⟩-COONa + ⟨O⟩-CH₂OH

74. Which of the following compounds gives iodoform on reaction with $NaOH$ and I_2 ?

(1) $CH_3CH_2CH_2OH$

(2) $CH_3CH_2 \overset{OH}{\underset{|}{CH}} - CH_3$

(3) $CH_3CH_2 \overset{O}{\overset{\|}{C}} CH_2 CH_3$

(4) $CH_3CH_2 \underset{\underset{CHO}{|}}{CH} - CH_3$
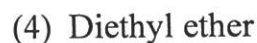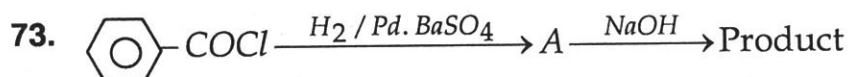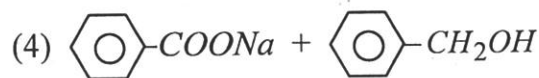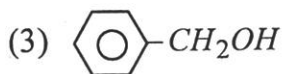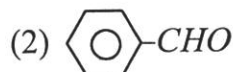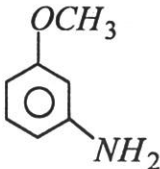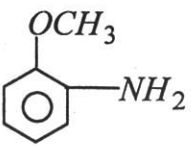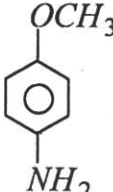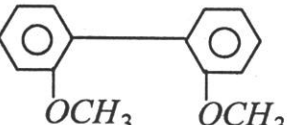
75. Stability of $(CH_3)_3C^+$ can be explained by :

(1) Inductive effect

(2) Mesomeric effect

(3) Hyperconjugation

(4) Both Inductive effect and Hyperconjugation

76. Which of the following does not react with benzene in presence of anhydrous $AlCl_3$?

(1) ⟨O⟩–COCl

(2) (⟨O⟩–CO)$_2$O

(3) ⟨O⟩–Cl

(4) ⟨O⟩–CH$_2$Cl

77.

$$\xrightarrow[\text{liq.}NH_3]{KNH_2}$$
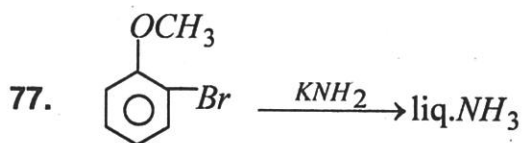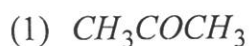
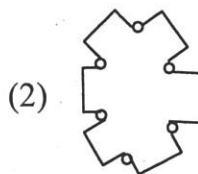The product obtained in above reaction is :

(1)

(2)

(3)

(4)

78. Phenol can be converted into salicylaldehyde using :

(1) Kolbe's reaction

(2) Reimer-Tiemann reaction

(3) Friedal crafts reaction

(4) Cross aldol condensation

79. $C_3H_6O(A)$ does not reduce Tollen's reagent, does not give iodoform test, but reacts with HI. A can be :

(1) CH_3COCH_3

(2) CH_3CH_2CHO

(3) $CH_2 = CH - O - CH_3$

(4) $H_3C - CH - CH_2$
    $\diagdown \diagup$
      O
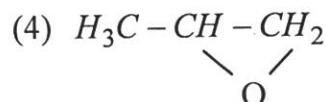
80. 18-Crown-6 is represented by :

(1)

(2)

(3) Both are correct

(4) None is correct

81. Allylic halogen substitution can be done with :

(1) Halogen at high temperature

(2) NBS in sunlight

(3) Sulphuryl chloride in sunlight

(4) All of these

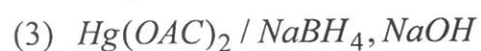**82.** Allylic alcohol is obtained when glycerol reacts with the following at 260°C :
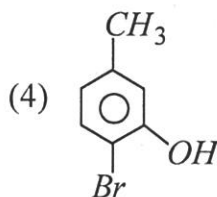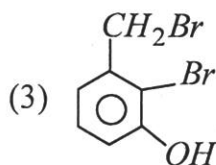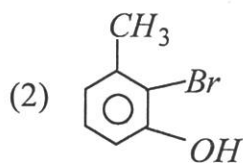
(1) Formic acid   (2) Oxalic acid   (3) Both   (4) None
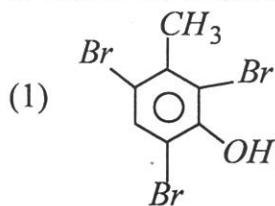
83. $(CH_3)_3 C - CH = CH_2 \xrightarrow{X} (H_3C)_3 C - \underset{\underset{OH}{|}}{CH} - CH_3$ X can be :

(1) $BH_3 . THF / H_2O_2 . {}^-OH$

(2) H_3O^+

(3) $Hg(OAC)_2 / NaBH_4, NaOH$

(4) None

84. m-cresol on bromination gives :

(1)

(2)

(3)

(4)

85. Dipole moment is shown by :

(1) 2, 2-dimethylpropane

(2) Trans-2-pentene

(3) Trans-1,2-dichloroethene

(4) 2, 2, 3, 3-tetrabromobutane

86. Which of the following does not give white precipitate when boiled with alcoholic silver nitrate ?

(1) Methyl chloride

(2) Carbon tetrachloride

(3) Benzyl chloride

(4) Vinyl chloride

87. The formation of cyanohydrin from a ketone is an example of :

(1) Electrophilic addition

(2) Nucleophilic addition

(3) Electrophilic substitution

(4) Nucleophilic substitution

88. When acetaldehyde is heated with Fehling solution it gives a precipitate of :

(1) Cu

(2) CuO

(3) Cu_2O

(4) Cu, CuO, Cu_2O

89. In the cannizaro reaction given below

$2PhCHO \xrightarrow{\ominus OH} PhCH_2OH + PhCOO^{\ominus}$, the slowest step is :

(1) Attack of $^\ominus OH$ at the carbonyl group

(2) Transfer of hydride to carbonyl group

(3) The abstraction of proton from carboxylic acid

(4) The deprotonation of $PhCH_2OH$

90. Which of the following carboxylic acids undergo decarboxylation easity ?

    (1) $C_6H_5COCH_2COOH$

    (2) $C_6H_5COCOOH$

    (3) $C_6H_5CH(OH)COOH$

    (4) $C_6H_5CH(NH_2)COOH$
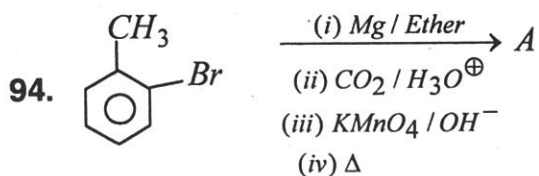
91. In benzilic acid rearrangement :

    (1) Benzaldehyde is converted to benzoin

    (2) Benzoin is converted to benzilic acid

    (3) Benzilic acid is converted to benzoin

    (4) Benzil is converted to benzilic acid

92. Grignard reagent shows addition on :

    (1) $\diagdown C = O$

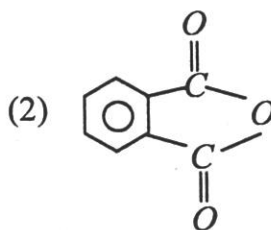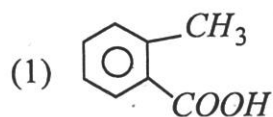   (2) $\diagdown C = S$

    (3) $-C \equiv N$

    (4) All

93. A positive carbylamine test is given by :

    (1) N, N-Dimethylaniline

    (2) 2-4- Dimethylaniline

    (3) N, N-dimethyl-p-nitroaniline

    (4) p-methyl benzylamine

94.

    A is :

95.

$\xrightarrow[\text{Warm}]{H_2O}$ Product

Product is :

(1) Picric acid

(2) Phenol

(3) Chlorobenzene

(4) No reaction since $(C-Cl)$ bond is stable

96.

$-N(CH_3)_2$ $\xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) } HNO_2}$ $A + B$

A and B are :

(1) $HO-$$-NO$, $(CH_3)_2NH$

(2) $HO-$$-OH$, $(CH_3)_2NH$
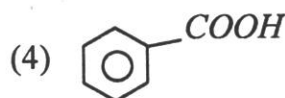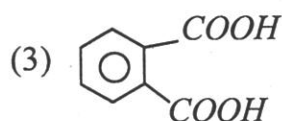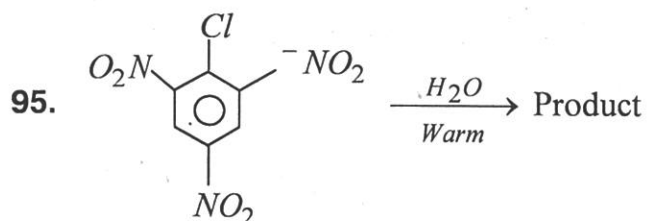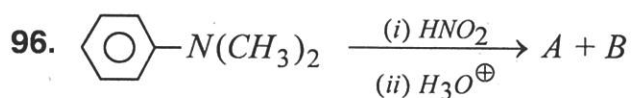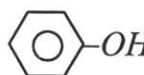
(3) $HO-$$-NO$, $CH_3CH_2NH_2$

(4) None is correct

97. A β-hydroxy carbonyl compound is obtained by the action of $NaOH$ on :

(1) $R_3C.CHO$ (2) C_6H_5CHO (3) CH_3CHO (4) $HCHO$

98. Which have acidic H, but not reacting with $NaHCO_3$?

(1) CH_3COOH (2) $-OH$ (3) $CH_3\overset{\overset{O}{\|}}{C}CH_2CN$ (4) NH_3

99. Predominant product formed when HCl adds to 2,4-hexadiene is :

(1) 4-chloro-2-hexene

(2) 2-chloro-3-hexene

(3) 2-chloro-4-hexene

(4) 1-chloro-2-hexene

100. Electrophile $NO_2^{\oplus}$ attacks the following :

I   II   III   IV

In which cases $NO_2^{\oplus}$ will be at meta position :

(1) II and IV   (2) I, II and III

(3) II and III only   (4) I only

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2019 (Chemistry)-(SET-X)

10358

B

Sr. No. ....

Time : 1½ **Hours**   Total Questions : **100**   Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

_____   _____
(Signature of the Candidate)   (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are **compulsory** and carry equal marks. The candidates are required to attempt all questions.

2. The candidate **must return** this question booklet and the OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along-with answer key of all the A, B, C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.

6. *Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.*

7. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ Mark (0.25 Mark) discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

8. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

CPG-EE-2019(Chemistry)-(SET-X)/(B)

B

1. The aqueous solution of which of the following has maximum pH ?

   (1) $NaClO$
   (2) $NaClO_2$
   (3) $NaClO_3$
   (4) $NaClO_4$

2. Which one of the following compounds will exhibit linkage isomerism ?

   (1) $[Pt(NH_3)_2Cl_2]$
   (2) $[Co(NH_3)_5NO_2]Cl_2$
   (3) $[Co(NH_3)_4Cl_2]Cl$
   (4) $[Co(en)_2Cl_2]Cl_2$

3. Which oxide of vanadium is most likely to be basic and ionic ?

   (1) VO
   (2) V_2O_3
   (3) VO_2
   (4) V_2O_5

4. Which of the following complex is non-ionisable ?

   (1) $CoCl_3 . 6NH_3$
   (2) $CoCl_3 . 5NH_3$
   (3) $CoCl_3 . 4NH_3$
   (4) $CoCl_3 . 3NH_3$

5. EAN (Effective Atomic No.) of Fe^{2+} ion in $[Fe^{2+}(CN_6)]^{4-}$ is equal to :

   (1) 26
   (2) 36
   (3) 18
   (4) 54

6. Which is used in cancer chemotherapy ?

   (1) Zeise's salt
   (2) Auranofin
   (3) Cisplatin
   (4) None

7. Which pairing is *wrong* ?

   (1) $[Fe(H_2O)_6]^{2+}$ – Paramagnetic
   (2) $[Fe(CN)_6]^{4-}$ – Paramagnetic
   (3) $[CoF_6]^{3-}$ – Paramagnetic
   (4) $Ni(CO)_4$ – Diamagnetic

8. Formula of pitch blende is :

   (1) UO_2
   (2) U_3O_8
   (3) UF_4
   (4) None of these

9. Which one of the following is the best method of preparation of acetophenone ?

   (1) $PhCOOEt + CH_3MgBr \rightarrow$
   (2) $PhCOCl + CH_3MgBr \rightarrow$
   (3) $PhCONH_2 + CH_3MgBr \rightarrow$
   (4) $PhCN + CH_3MgBr \rightarrow$

10. Dilute HCl is used to separate following radical :

    (1) Ag^+ (2) Ca^{2+} (3) Sn^{2+} (4) Ba^{2+}

11. In benzilic acid rearrangement :

    (1) Benzaldehyde is converted to benzoin

    (2) Benzoin is converted to benzilic acid

    (3) Benzilic acid is converted to benzoin

    (4) Benzil is converted to benzilic acid

12. Grignard reagent shows addition on :

    (1) $\diagdown C = O$ (2) $\diagdown C = S$ (3) $-C \equiv N$ (4) All

13. A positive carbylamine test is given by :

    (1) N, N-Dimethylaniline   (2) 2-4- Dimethylaniline

    (3) N, N-dimethyl-p-nitroaniline   (4) p-methyl benzylamine

14.

    A is :

    (1)   (2)

    (3)   (4)

15.

$$\xrightarrow[Warm]{H_2O} \text{Product}$$

Product is :

(1) Picric acid

(2) Phenol

(3) Chlorobenzene

(4) No reaction since $(C - Cl)$ bond is stable

16. $\langle O \rangle - N(CH_3)_2 \xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ HNO_2} A + B$

A and B are :

(1) $HO-\langle O \rangle-NO$, $(CH_3)_2NH$

(2) $HO-\langle O \rangle-OH$, $(CH_3)_2NH$

(3) $HO-\langle O \rangle-NO$, $CH_3CH_2NH_2$

(4) None is correct

17. A β-hydroxy carbonyl compound is obtained by the action of $NaOH$ on :

(1) $R_3C.CHO$ (2) C_6H_5CHO (3) CH_3CHO (4) $HCHO$

18. Which have acidic H, but not reacting with $NaHCO_3$?

(1) CH_3COOH (2) $\langle O \rangle-OH$ (3) $CH_3 \overset{\overset{O}{\|}}{C} CH_2CN$ (4) NH_3

19. Predominant product formed when HCl adds to 2,4-hexadiene is :

(1) 4-chloro-2-hexene

(2) 2-chloro-3-hexene

(3) 2-chloro-4-hexene

(4) 1-chloro-2-hexene

20. Electrophile $NO_2^\oplus$ attacks the following :

CCl_3 NO_2 $\overset{\oplus}{NH_3}$ $O^\ominus$

I   II   III   IV

In which cases $NO_2^\oplus$ will be at meta position :

(1) II and IV

(2) I, II and III

(3) II and III only

(4) I only

21. Which of the following compounds shows a sharp IR absorption band at 1700 cm^{-1} and a broad band at $3300\,cm^{-1}$?

(1) Ethanol

(2) Ethanoic acid

(3) Propanone

(4) Diethyl ether

22. A signal in NMR appears at 30Hz on a 60 MHz instrument. Same signal on a 400 MHz instrument will appear at :

(1) 30 Hz

(2) 90 Hz

(3) 200 Hz

(4) 400 Hz

23. $-COCl \xrightarrow{H_2/Pd.BaSO_4} A \xrightarrow{NaOH} $ Product

The product in the reaction is :

(1) $-COONa$

(2) $-CHO$

(3) $-CH_2OH$

(4) $-COONa + $ $-CH_2OH$

24. Which of the following compounds gives iodoform on reaction with $NaOH$ and I_2 ?

(1) $CH_3CH_2CH_2OH$

(2) $CH_3CH_2 \overset{\overset{OH}{|}}{CH}-CH_3$

(3) $CH_3CH_2 \overset{\overset{O}{\|}}{C} CH_2 CH_3$

(4) $CH_3CH_2 \underset{\underset{CHO}{|}}{CH} -CH_3$

25. Stability of $(CH_3)_3 C^+$ can be explained by :

   (1) Inductive effect

   (2) Mesomeric effect

   (3) Hyperconjugation

   (4) Both Inductive effect and Hyperconjugation

26. Which of the following does not react with benzene in presence of anhydrous $AlCl_3$?

   (1) $\langle O \rangle$–$COCl$

   (2) $(\langle O \rangle$–$CO)_2 O$

   (3) $\langle O \rangle$–Cl

   (4) $\langle O \rangle$–CH_2Cl

27.

$$\text{(o-bromoanisole)} \xrightarrow[\text{liq.}NH_3]{KNH_2}$$

The product obtained in above reaction is :

   (1) [m-methoxyaniline structure: OCH_3 and NH_2]

   (2) [o-methoxyaniline structure: OCH_3 and NH_2]

   (3) [p-methoxyaniline structure: OCH_3 and NH_2]

   (4) [biphenyl structure with OCH_3 OCH_3]
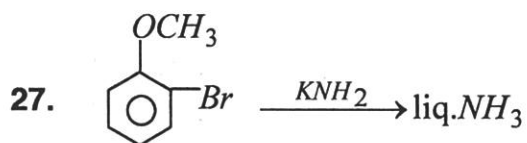
28. Phenol can be converted into salicylaldehyde using :

   (1) Kolbe's reaction

   (2) Reimer-Tiemann reaction

   (3) Friedal crafts reaction

   (4) Cross aldol condensation

29. $C_3H_6O(A)$ does not reduce Tollen's reagent, does not give iodoform test, but reacts with HI. A can be :

(1) CH_3COCH_3

(2) CH_3CH_2CHO

(3) $CH_2 = CH - O - CH_3$

(4) $H_3C - CH - CH_2$ with O bridge
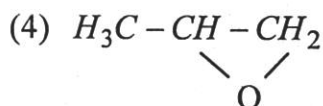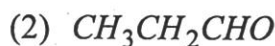
30. 18-Crown-6 is represented by :

(1)

(2)
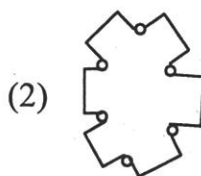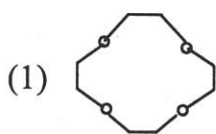
(3) Both are correct

(4) None is correct

31. The critical temperature of a liquid having boiling point 73°C is :

(1) 246°C

(2) 219°C

(3) 182°C

(4) None of these

32. Which of the following will show an ESR spectrum ?

(1) Cu^+ ion

(2) N_2 molecule

(3) Cu^{2+} ion

(4) CH_4 molecule

33. The ESR spectrum could be used to map molecular orbital by unpaired electron, which is aided by McConnel equation. The said equation is :

(1) $Q = a\rho$

(2) $Q = a + \rho$

(3) $a = Q\rho$

(4) $Q = a - \rho$

where ρ is the unpaired electron density on carbon atom and a is hyperfine splitting constant.

34. The molecule which is IR inactive and Raman active is :

(1) Protein

(2) HCl

(3) SO_2

(4) N_2

35. The pH of an aqueous solution of 1×10^{-7} M HCl is :

(1) 7
(2) slightly less than 7

(3) slightly higher than 7
(4) none of these

36. When a beam of light is passed through a colloidal solution, it suffers :

(1) Reflection
(2) Refraction

(3) Scattering
(4) All of these

37. Dry ice is used in fire extinguishers. It is stored in solid form in the cylinder. When sprayed on a fire, it quickly changes into gas called CO_2. The change of state is known as :

(1) Sublimation
(2) Evaporation

(3) Condensation
(4) Distillation

38. Milk is a/an :

(1) Suspension
(2) Pure solution

(3) Gel
(4) Emulsion

39. The IR absorption at 1665 cm^{-1} in salicylic acid is due to :

(1) C – H bending
(2) O – H stretching

(3) C = O stretching
(4) O – H bending

40. Strong covalent bonds exist between polymer chains in :

(1) Elastomers
(2) Thermoplasts

(3) Thermosets
(4) All polymers

41. In synthesis of Grignards reagent, alkyl halide reacts with Mg in presence of :

(1) An ester
(2) Dry ether
(3) Alcohol
(4) Amide

42. The strongest acidic strength is that of :

(1) C_2H_5OH
(2) H_2O
(3) HCN
(4) Cl_3CCOOH

43. In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?

(1) PCl_5 (2) SF_4 (3) I_3^- (4) $SbCl_5^{2-}$

44. The Compton wave length of an electron, λ_c is expressed as :

(1) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{m}$ (2) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{2m}$

(3) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{mc}$ (4) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{mc}$

45. If $\hat{A}$ and $\hat{B}$ are two operators such that $[\hat{A}, \hat{B}] = 1$, then value of $[\hat{A}, \hat{B}^2]$ is :

(1) $\hat{B}$ (2) $2\hat{B}$ (3) $\hat{A}$ (4) $2\hat{A}$

46. Which one of the following is *correct* relation ?

(1) $S = RlnW$ (2) $S = klnW$

(3) $C_p = \left(\dfrac{\partial H}{\partial T}\right)_V$ (4) $C_v = \left(\dfrac{\partial E}{\partial T}\right)_P$

(All the symbols have their usual meanings.)

47. The degrees of freedom present in the system comprised of a gas in equilibrium with its solution in liquid will be :

(1) 2   (2) 1   (3) 3   (4) None of these

48. Polydispersity Index (PDI) of a polymer molecular is expressed as :

(1) $\dfrac{M_w}{M_n}$ (2) $\dfrac{M_{\dot{n}}}{M_w}$ (3) $M_w \times M_n$ (4) $M_w + M_n$

Where M_w and M_n are mass-average molar mass and number-average molar mass of a polymer sample.

49. The radius of $_{13}^{27}Al$ nucleous is :

(1) $4.5 \times 10^{-14}\,m$ (2) $4.5 \times 10^{-15}\,m$

(3) $4.5 \times 10^{-13}\,m$ (4) $4.5 \times 10^{-16}\,m$

50. The temperature at which the virial coefficient of a real gas is zero is called :

(1) Boiling point

(2) Eutectic point

(3) Boyle temperature

(4) Critical temperature

51. Wilson disease is caused by the excess of :

(1) Zinc   (2) Copper   (3) Magnesium   (4) Lead

52. In the compound $Fe_4[Fe(CN)_6]$ the respective oxidation states of Fe are :

(1) II, III   (2) II, II   (3) III, II   (4) III, III

53. In vitro reaction of excess of O_2 with free heme B in aqueous medium, end product is :

(1) Hematin

(2) Heme B CO_2

(3) $[O_2^- - Fe(III) - protoporphyrin - IX]$

(4) All of these

54. The main reason for larger number of oxidation states exhibited by the actinoids than the corresponding lanthanoids is :

(1) More energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(2) Lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(3) Larger atomic size of actinoids than the lanthanoids.

(4) Greater reactive nature of actinoids than the lanthanoids.

55. Which of the following has zero dipole moment ?

(1) ClF (2) PCl_3 (3) SiF_4 (4) $CFCl_3$

56. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is :

(Atomic Nos. Y = 39, La = 57, Eu = 63, Lu = 71)

(1) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (2) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

(3) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (4) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

57. *AgCl* is soluble in ammonia due to the formation of :

    (1) $Ag(NH_2)Cl$ (2) $[Ag(NH_3)_2]Cl$

    (3) $AgNH_2$ (4) $NH_4[AgCl(NH)_2]$

58. Hydrogen directly combines with :

    (1) Au (2) Cu (3) Ni (4) Ca

59. Which is used in filling cavities in teeth ?

    (1) $Cu\ (Hg)$ (2) $Ag\ (Hg)$

    (3) $Zn\ (Hg)$ (4) $Ni\ (Hg)$

60. Mg^{2+} is prepared in photosynthesis by chlorophyll because :

    (1) It has strong spin-orbit coupling

    (2) It has weak spin-orbit coupling

    (3) It is a heavy metal

    (4) It binds strongly with chlorophyll

61. The internal pressure of an ideal gas is :

    (1) zero   (2) infinite   (3) 1   (4) None of these

62. The standard state for a solid is :

    (1) Pure state of the solid at one atmospheric pressure

    (2) Pure state of the solid at one atmospheric pressure and 273 K temperature

    (3) Pure state of the solid at one atmospheric pressure and 298 K temperature

    (4) Pure state of the solid at one atmospheric pressure at any given temperature

63. The Millar indices of crystal planes cut through the crystal axis at $(2a, 3b, c)$ are :

    (1) (1 2 2)   (2) (2 3 6)

    (3) (6 3 2)   (4) (3 2 6)

64. Which one of the following statements is *true* ?

    (1) Work is a state function.

    (2) Entropies are additive and probabilities are multiplicative.

    (3) Entropies are multiplicative and probabilities are additive.

    (4) The entropy possessed by substance at 298 K is called residual Entropy.

65. A liquid is in equilibrium with its vapours at its boiling point. The molecules in the two phases have the same :

    (1) Chemical potential   (2) Enthalpy

    (3) Entropy   (4) None of these

66. In which of the following reactions, the collision theory of reactions rate is valid ?

    (1) Reaction between two diatomic molecules

    (2) Reaction between an atom and a diatomic molecule

    (3) Reaction between two complex molecules

    (4) Reaction between two atoms

67. The cell potential is a/an :

    (1) Colligative property   (2) Thermodynamic property

    (3) Extensive property   (4) Intensive property

68. For an isentropic change of state :

    (1) $dS = 0$ (2) $dS = 1$ (3) $dH = 0$ (4) None of these

69. Isotonic solutions have same :

    (1) Viscosity   (2) Surface tension

    (3) Freezing point   (4) Osmotic pressure

70. The rotational spectrum of a rigid diatomic rotator is comprised of equally spaced lines with spacing equal to :

    (1) B (2) $2B$ (3) $2.5B$ (4) $3B$

71. Which of the following statements about tetramethylsilane is *incorrect* ?

(1) It is Inert

(2) It is used to provide a reference against which other peaks are measured

(3) It is volatile and can be easily distilled off and used again

(4) It produces a single peak at $\delta = 10$

72. The ionic strength of 0.25 molal K_2SO_4 solution will be :

(1) 0.25   (2) 0.50   (3) 0.75   (4) 0.60

73. Debye-Hückel limiting law equation relates :

(1) Activity coefficient with ionic strength of the solution

(2) Mean ionic coefficient with ionic strength of the solution

(3) Activity coefficient with square of the ionic strength of the solution

(4) None of these

74. 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

75. In the phenomenon of Larmor pression, the angular frequency of pression, "Larmor frequency" is expressed as :

(1) $w = r + B_z$ (2) $w = r - B_z$ (3) $w = r / B_z$ (4) $w = rB_z$

where $r = \dfrac{\mu}{I(h/2\pi)}$ and all the notations have usual meanings.
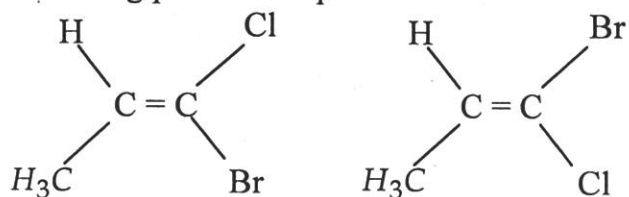
76. Which of the following relations represent Clasius-Claypeyron equation ?

(1) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = -\dfrac{H}{T^2}$ (2) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = H$

(3) $\dfrac{\partial}{\partial T} \ln k_P = \dfrac{\Delta H^\circ}{RT^2}$ (4) $\dfrac{\partial}{\partial T} \ln P = \dfrac{\Delta H^\circ_{vaporization}}{RT^2}$

77. Which of the following reaction involves rearrangement of nitrogen yields ?

    (1) Wittig reaction   (2) Von-Richter reaction .

    (3) Sommlet-Hauser reaction   (4) Pinacol-Pinacolone rearrangement

78. Following pair of compounds are :

    (1) Enantiomers   (2) Diastereomers

    (3) Geometrical isomers   (4) Homomers

79. Absolute configuration of :
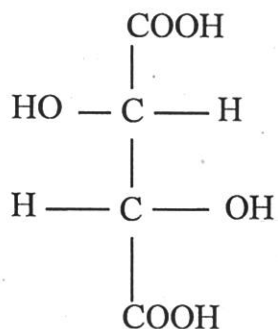
    (1) 2S, 3S   (2) 2R, 3R   (3) 2S, 3R   (4) 2R, 3S

80. Which among the following reagents gives syn addition with alkenes :

    I Br_2 II   Dil $KMnO_4$ / ^-OH

    III OSO_4 / $NaSO_3H$ / H_2O IV H_2 /Ni/Δ

    Select the answer from the codes given below :

    (1) Only I   (2) II and III

    (3) II, III and IV   (4) Only IV

81. Which of the following has least de-Broglie wavelength ?

    (1) e^- (2) p (3) CO_2 (4) SO_2

82. The geometry of AsF_5 is :

(1) Pyramidal

(2) Tetrahedral

(3) Trigonal bipyramidal

(4) Octahedral

83. The effective nuclear charge at the periphery of Cr atom, using slater rule is :

(1) 3.35   (2) 3.70   (3) 1.70   (4) 2.60

84. The theoretical value of magnetic moment of Gd^{3+} is :

(1) 7.94   (2) 9.72   (3) 9.57   (4) 7.63

85. Which of the following will *not* show H-bonding ?

(1) HF (2) NH_3 (3) H_2O (4) CH_4

86. The oxide which gives H_2O_2 on treatment with dilute acid is :

(1) PbO_2 (2) Na_2O_2 (3) MnO_2 (4) TiO_2

87. Inorganic benzene is :

(1) BH_3OH_3

(2) $B_3N_3H_6$

(3) B_2H_6

(4) B_4H_{10}

88. The correct order of increasing size is :

(1) $Na^+ < Li^+ < Be^{2+} < B^{3+}$

(2) $B^{3+} < Be^{2+} < Li^+ < Na^+$

(3) $Be^{2+} < B^{3+} < Na^+ < Li^+$

(4) $Li^+ < Na^+ < B^{3+} < Be^{2+}$

89. Addition of As in trace amounts to pure Ge will result in the formation of :

(1) n-type semiconductor

(2) Germanium arsenic

(3) p-type semiconductor

(4) Super conducting-alloy

90. Freon is :

(1) CCl_3H

(2) CF_4

(3) CF_3H_3

(4) CCl_2F_2

91. Allylic halogen substitution can be done with :

    (1) Halogen at high temperature

    (2) NBS in sunlight

    (3) Sulphuryl chloride in sunlight

    (4) All of these

92. Allylic alcohol is obtained when glycerol reacts with the following at 260°C :

    (1) Formic acid   (2) Oxalic acid   (3) Both   (4) None

93. $(CH_3)_3C - CH = CH_2 \xrightarrow{\ X\ } (H_3C)_3C - \underset{\underset{OH}{|}}{CH} - CH_3$ X can be :

    (1) $BH_3 . THF / H_2O_2 .\ ^-OH$

    (2) H_3O^+

    (3) $Hg(OAC)_2 / NaBH_4, NaOH$

    (4) None

94. m-cresol on bromination gives :
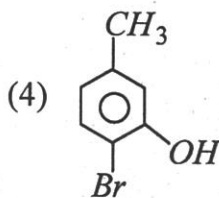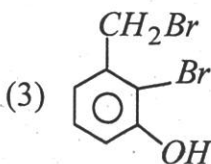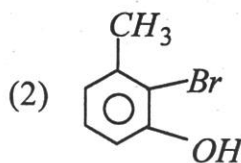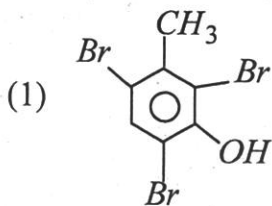
95. Dipole moment is shown by :

    (1) 2, 2-dimethylpropane   (2) Trans-2-pentene

    (3) Trans-1,2-dichloroethene   (4) 2, 2, 3, 3-tetrabromobutane

96. Which of the following does not give white precipitate when boiled with alcoholic silver nitrate ?

   (1) Methyl chloride   (2) Carbon tetrachloride

   (3) Benzyl chloride   (4) Vinyl chloride

97. The formation of cyanohydrin from a ketone is an example of :

   (1) Electrophilic addition   (2) Nucleophilic addition

   (3) Electrophilic substitution   (4) Nucleophilic substitution

98. When acetaldehyde is heated with Fehling solution it gives a precipitate of :

   (1) Cu (2) CuO (3) Cu_2O (4) Cu, CuO, Cu_2O

99. In the cannizaro reaction given below

   $2PhCHO \xrightarrow{\ominus OH} PhCH_2OH + PhCOO^{\ominus}$, the slowest step is :

   (1) Attack of $^{\ominus}OH$ at the carbonyl group

   (2) Transfer of hydride to carbonyl group

   (3) The abstraction of proton from carboxylic acid

   (4) The deprotonation of $PhCH_2OH$

100. Which of the following carboxylic acids undergo decarboxylation easity ?

   (1) $C_6H_5COCH_2COOH$ (2) $C_6H_5COCOOH$

   (3) $C_6H_5CH(OH)COOH$ (4) $C_6H_5CH(NH_2)COOH$

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2019 (Chemistry)-(SET-X)   10359

C

Sr. No. ....

Time : **1½ Hours**   Total Questions : **100**   Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

_____   _____
(Signature of the Candidate)   (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are **compulsory** and carry equal marks. The candidates are required to attempt all questions.

2. The candidate **must return** this question booklet and the OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along-with answer key of all the A, B, C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.

6. *Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.*

7. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ Mark (0.25 Mark) discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

8. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

CPG-EE-2019(Chemistry)-(SET-X)/(C)

C 1

1. The internal pressure of an ideal gas is :

   (1) zero   (2) infinite   (3) 1   (4) None of these

2. The standard state for a solid is :

   (1) Pure state of the solid at one atmospheric pressure

   (2) Pure state of the solid at one atmospheric pressure and 273 K temperature

   (3) Pure state of the solid at one atmospheric pressure and 298 K temperature

   (4) Pure state of the solid at one atmospheric pressure at any given temperature

3. The Millar indices of crystal planes cut through the crystal axis at $(2a, 3b, c)$ are :

   (1) (1 2 2)   (2) (2 3 6)

   (3) (6 3 2)   (4) (3 2 6)

4. Which one of the following statements is *true* ?

   (1) Work is a state function.

   (2) Entropies are additive and probabilities are multiplicative.

   (3) Entropies are multiplicative and probabilities are additive.

   (4) The entropy possessed by substance at 298 K is called residual Entropy.

5. A liquid is in equilibrium with its vapours at its boiling point. The molecules in the two phases have the same :

   (1) Chemical potential   (2) Enthalpy

   (3) Entropy   (4) None of these

6. In which of the following reactions, the collision theory of reactions rate is valid ?

   (1) Reaction between two diatomic molecules

   (2) Reaction between an atom and a diatomic molecule

   (3) Reaction between two complex molecules

   (4) Reaction between two atoms

7. The cell potential is a/an :

    (1) Colligative property   (2) Thermodynamic property

    (3) Extensive property   (4) Intensive property

8. For an isentropic change of state :

    (1) $dS = 0$ (2) $dS = 1$

    (3) $dH = 0$ (4) None of these

9. Isotonic solutions have same :

    (1) Viscosity   (2) Surface tension

    (3) Freezing point   (4) Osmotic pressure

10. The rotational spectrum of a rigid diatomic rotator is comprised of equally spaced lines with spacing equal to :

    (1) B (2) $2B$ (3) $2.5B$ (4) $3B$

11. Wilson disease is caused by the excess of :

    (1) Zinc   (2) Copper

    (3) Magnesium   (4) Lead

12. In the compound $Fe_4[Fe(CN)_6]$ the respective oxidation states of Fe are :

    (1) II, III   (2) II, II

    (3) III, II   (4) III, III

13. In vitro reaction of excess of O_2 with free heme B in aqueous medium, end product is :

    (1) Hematin

    (2) Heme B CO_2

    (3) $[O_2^- - Fe(III) - \text{protoporphyrin} - IX]$

    (4) All of these

14. The main reason for larger number of oxidation states exhibited by the actinoids than the corresponding lanthanoids is :

    (1) More energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

    (2) Lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

    (3) Larger atomic size of actinoids than the lanthanoids.

    (4) Greater reactive nature of actinoids than the lanthanoids.

15. Which of the following has zero dipole moment ?

    (1) ClF (2) PCl_3 (3) SiF_4 (4) $CFCl_3$

16. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is :

    (Atomic Nos. Y = 39, La = 57, Eu = 63, Lu = 71)

    (1) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (2) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

    (3) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (4) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

17. $AgCl$ is soluble in ammonia due to the formation of :

    (1) $Ag(NH_2)Cl$ (2) $[Ag(NH_3)_2]Cl$ (3) $AgNH_2$ (4) $NH_4[AgCl(NH)_2]$

18. Hydrogen directly combines with :

    (1) Au (2) Cu (3) Ni (4) Ca

19. Which is used in filling cavities in teeth ?

    (1) $Cu\,(Hg)$ (2) $Ag\,(Hg)$ (3) $Zn\,(Hg)$ (4) $Ni\,(Hg)$

20. Mg^{2+} is prepared in photosynthesis by chlorophyll because :

    (1) It has strong spin-orbit coupling

    (2) It has weak spin-orbit coupling

    (3) It is a heavy metal

    (4) It binds strongly with chlorophyll

4

21. Which of the following has least de-Broglie wavelength ?

    (1) e^- (2) p (3) CO_2 (4) SO_2

22. The geometry of AsF_5 is :

    (1) Pyramidal   (2) Tetrahedral

    (3) Trigonal bipyramidal   (4) Octahedral

23. The effective nuclear charge at the periphery of Cr atom, using slater rule is :

    (1) 3.35   (2) 3.70   (3) 1.70   (4) 2.60

24. The theoretical value of magnetic moment of Gd^{3+} is :

    (1) 7.94   (2) 9.72   (3) 9.57   (4) 7.63

25. Which of the following will **not** show H-bonding ?

    (1) HF (2) NH_3 (3) H_2O (4) CH_4

26. The oxide which gives H_2O_2 on treatment with dilute acid is :

    (1) PbO_2 (2) Na_2O_2 (3) MnO_2 (4) TiO_2

27. Inorganic benzene is :

    (1) BH_3OH_3 (2) $B_3N_3H_6$

    (3) B_2H_6 (4) B_4H_{10}

28. The correct order of increasing size is :

    (1) $Na^+ < Li^+ < Be^{2+} < B^{3+}$ (2) $B^{3+} < Be^{2+} < Li^+ < Na^+$

    (3) $Be^{2+} < B^{3+} < Na^+ < Li^+$ (4) $Li^+ < Na^+ < B^{3+} < Be^{2+}$

29. Addition of As in trace amounts to pure Ge will result in the formation of :

    (1) n-type semiconductor   (2) Germanium arsenic

    (3) p-type semiconductor   (4) Super conducting-alloy

30. Freon is :

    (1) CCl_3H (2) CF_4

    (3) CF_3H_3 (4) CCl_2F_2
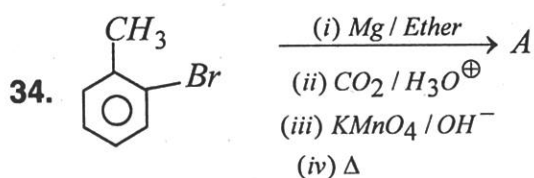
31. In benzilic acid rearrangement :

(1) Benzaldehyde is converted to benzoin

(2) Benzoin is converted to benzilic acid

(3) Benzilic acid is converted to benzoin

(4) Benzil is converted to benzilic acid
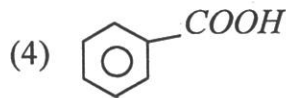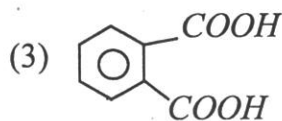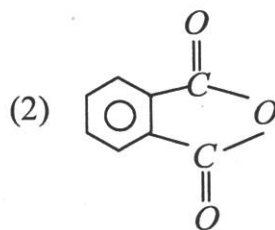
32. Grignard reagent shows addition on :

(1) $\overset{\diagdown}{\underset{\diagup}{C}} = O$ (2) $\overset{\diagdown}{\underset{\diagup}{C}} = S$ (3) $-C \equiv N$ (4) All
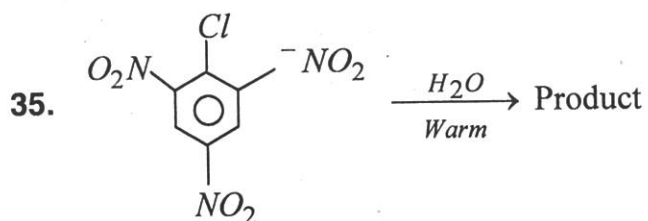
33. A positive carbylamine test is given by :

(1) N, N-Dimethylaniline

(2) 2-4- Dimethylaniline

(3) N, N-dimethyl-p-nitroaniline

(4) p-methyl benzylamine

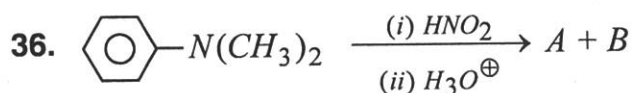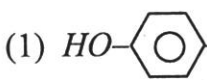**34.**

A is :

(1)

(2)

(3)

(4)

C

35.

$\xrightarrow[\text{Warm}]{H_2O}$ Product

Product is :

(1) Picric acid

(2) Phenol

(3) Chlorobenzene

(4) No reaction since $(C - Cl)$ bond is stable

36.

 $-N(CH_3)_2 \xrightarrow[\text{(ii) } H_3O^{\oplus}]{\text{(i) } HNO_2} A + B$

A and B are :

(1) HO——NO, $(CH_3)_2NH$

(2) HO——OH, $(CH_3)_2NH$
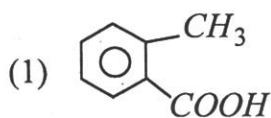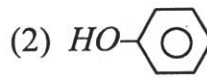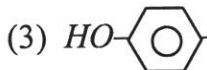
(3) HO——NO, $CH_3CH_2NH_2$

(4) None is correct

37. A β-hydroxy carbonyl compound is obtained by the action of $NaOH$ on :

(1) $R_3C . CHO$ (2) C_6H_5CHO (3) CH_3CHO (4) $HCHO$

38. Which have acidic H, but not reacting with $NaHCO_3$?

(1) CH_3COOH (2) $-OH$ (3) $CH_3\overset{\overset{O}{\|}}{C}CH_2CN$ (4) NH_3

39. Predominant product formed when HCl adds to 2,4-hexadiene is :

(1) 4-chloro-2-hexene

(2) 2-chloro-3-hexene

(3) 2-chloro-4-hexene

(4) 1-chloro-2-hexene

40. Electrophile $NO_2^{\oplus}$ attacks the following :

$$
\underset{I}{\overset{CCl_3}{\bigcirc}} \quad \underset{II}{\overset{NO_2}{\bigcirc}} \quad \underset{III}{\overset{\overset{\oplus}{N}H_3}{\bigcirc}} \quad \underset{IV}{\overset{O^{\ominus}}{\bigcirc}}
$$

In which cases $NO_2^{\oplus}$ will be at meta position :

(1) II and IV

(2) I, II and III

(3) II and III only

(4) I only

41. Which of the following statements about tetramethylsilane is *incorrect* ?

(1) It is Inert

(2) It is used to provide a reference against which other peaks are measured

(3) It is volatile and can be easily distilled off and used again

(4) It produces a single peak at $\delta = 10$

42. The ionic strength of 0.25 molal K_2SO_4 solution will be :

(1) 0.25   (2) 0.50   (3) 0.75   (4) 0.60

43. Debye-Hückel limiting law equation relates :

(1) Activity coefficient with ionic strength of the solution

(2) Mean ionic coefficient with ionic strength of the solution

(3) Activity coefficient with square of the ionic strength of the solution

(4) None of these

44. 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

C.

45. In the phenomenon of Larmor pression, the angular frequency of pression, "Larmor frequency" is expressed as :

(1) $w = r + B_z$ (2) $w = r - B_z$ (3) $w = r / B_z$ (4) $w = rB_z$

where $r = \dfrac{\mu}{I(h/2\pi)}$ and all the notations have usual meanings.

46. Which of the following relations represent Clasius-Claypeyron equation ?

(1) $\left[\dfrac{\partial}{\partial T}(G/T) \right]_P = -\dfrac{H}{T^2}$

(2) $\left[\dfrac{\partial}{\partial T}(G/T) \right]_P = H$

(3) $\dfrac{\partial}{\partial T} lnk_P = \dfrac{\Delta H°}{RT^2}$

(4) $\dfrac{\partial}{\partial T} lnP = \dfrac{\Delta H°_{vaporization}}{RT^2}$

47. Which of the following reaction involves rearrangement of nitrogen yields ?
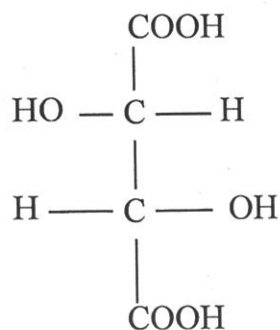
(1) Wittig reaction

(2) Von-Richter reaction

(3) Sommlet-Hauser reaction

(4) Pinacol-Pinacolone rearrangement

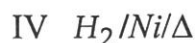**48.** Following pair of compounds are :
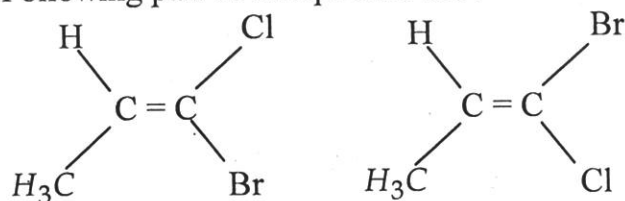
(1) Enantiomers

(2) Diastereomers

(3) Geometrical isomers

(4) Homomers

49. Absolute configuration of :

(1) 2S, 3S   (2) 2R, 3R   (3) 2S, 3R   (4) 2R, 3S

50. Which among the following reagents gives syn addition with alkenes :

I Br_2

II Dil $KMnO_4 / {}^-OH$

III $OSO_4 / NaSO_3H / H_2O$

IV $H_2 / Ni / \Delta$

Select the answer from the codes given below :

(1) Only I   (2) II and III   (3) II, III and IV   (4) Only IV

51. In synthesis of Grignards reagent, alkyl halide reacts with Mg in presence of :

(1) An ester   (2) Dry ether   (3) Alcohol   (4) Amide

52. The strongest acidic strength is that of :

(1) C_2H_5OH

(2) H_2O

(3) HCN

(4) Cl_3CCOOH

53. In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?

(1) PCl_5 (2) SF_4 (3) I_3^- (4) $SbCl_5^{2-}$

54. The Compton wave length of an electron, λ_c is expressed as :

(1) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{m}$

(2) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{2m}$

(3) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{mc}$

(4) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{mc}$

55. If $\hat{A}$ and $\hat{B}$ are two operators such that $[\hat{A}, \hat{B}] = 1$, then value of $[\hat{A}, \hat{B}^2]$ is :

(1) $\hat{B}$ (2) $2\hat{B}$ (3) $\hat{A}$ (4) $2\hat{A}$

56. Which one of the following is *correct* relation ?

(1) $S = R \ln W$

(2) $S = k \ln W$

(3) $C_p = \left(\dfrac{\partial H}{\partial T}\right)_V$

(4) $C_v = \left(\dfrac{\partial E}{\partial T}\right)_P$

(All the symbols have their usual meanings.)

57. The degrees of freedom present in the system comprised of a gas in equilibrium with its solution in liquid will be :

(1) 2   (2) 1   (3) 3   (4) None of these

58. Polydispersity Index (PDI) of a polymer molecular is expressed as :

(1) $\dfrac{M_w}{M_n}$ (2) $\dfrac{M_n}{M_w}$ (3) $M_w \times M_n$ (4) $M_w + M_n$

Where M_w and M_n are mass-average molar mass and number-average molar mass of a polymer sample.

59. The radius of $_{13}^{27}Al$ nucleous is :

(1) 4.5×10^{-14} m   (2) 4.5×10^{-15} m

(3) 4.5×10^{-13} m   (4) 4.5×10^{-16} m

60. The temperature at which the virial coefficient of a real gas is zero is called :

(1) Boiling point   (2) Eutectic point

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61. Which of the following compounds shows a sharp IR absorption band at 1700 cm^{-1} and a broad band at 3300 cm^{-1} ?

(1) Ethanol   (2) Ethanoic acid

(3) Propanone   (4) Diethyl ether

62. A signal in NMR appears at 30Hz on a 60 MHz instrument. Same signal on a 400 MHz instrument will appear at :

(1) 30 Hz   (2) 90 Hz   (3) 200 Hz   (4) 400 Hz

63. $\langle O \rangle - COCl \xrightarrow{H_2 / Pd.\, BaSO_4} A \xrightarrow{NaOH} $ Product

The product in the reaction is :

(1) $\langle O \rangle - COONa$ (2) $\langle O \rangle - CHO$

(3) $\langle O \rangle - CH_2OH$ (4) $\langle O \rangle - COONa + \langle O \rangle - CH_2OH$

64. Which of the following compounds gives iodoform on reaction with $NaOH$ and I_2 ?

(1) $CH_3CH_2CH_2OH$

(2) $CH_3CH_2 \overset{\overset{\displaystyle OH}{|}}{CH}-CH_3$

(3) $CH_3CH_2 \overset{\overset{\displaystyle O}{\|}}{C} CH_2 CH_3$

(4) $CH_3CH_2 \underset{\underset{\displaystyle CHO}{|}}{CH} - CH_3$
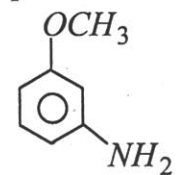
65. Stability of $(CH_3)_3 C^+$ can be explained by :
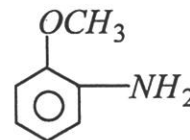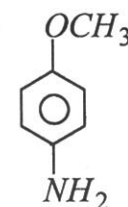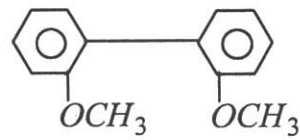
(1) Inductive effect

(2) Mesomeric effect

(3) Hyperconjugation

(4) Both Inductive effect and Hyperconjugation

66. Which of the following does not react with benzene in presence of anhydrous $AlCl_3$?

(1) ⬡–$COCl$

(2) (⬡–$CO)_2O$

(3) ⬡–Cl

(4) ⬡–CH_2Cl

67.
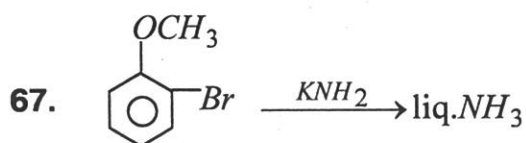
The product obtained in above reaction is :

(1)

(2)

(3)

(4)

68. Phenol can be converted into salicylaldehyde using :

(1) Kolbe's reaction

(2) Reimer-Tiemann reaction

(3) Friedal crafts reaction

(4) Cross aldol condensation

69. $C_3H_6O(A)$ does not reduce Tollen's reagent, does not give iodoform test, but reacts with HI. A can be :

(1) CH_3COCH_3

(2) CH_3CH_2CHO

(3) $CH_2 = CH - O - CH_3$

(4) $H_3C - CH - CH_2$
$\qquad\qquad\quad \diagdown \diagup$
$\qquad\qquad\qquad O$

**70.** 18-Crown-6 is represented by :

(1)

(2)
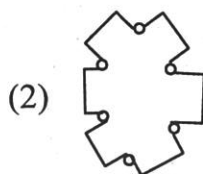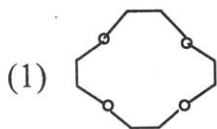
(3) Both are correct

(4) None is correct

71. Allylic halogen substitution can be done with :

(1) Halogen at high temperature

(2) NBS in sunlight

(3) Sulphuryl chloride in sunlight

(4) All of these

72. Allylic alcohol is obtained when glycerol reacts with the following at 260°C :

(1) Formic acid   (2) Oxalic acid   (3) Both   (4) None

73. $(CH_3)_3C-CH=CH_2 \xrightarrow{X} (H_3C)_3C-\underset{\underset{OH}{|}}{CH}-CH_3$ X can be :
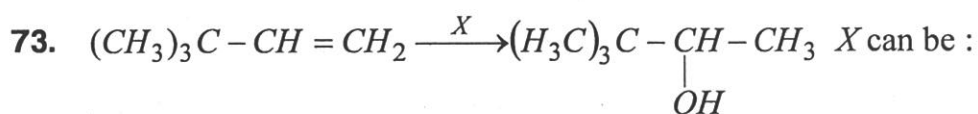
(1) $BH_3 \cdot THF / H_2O_2 \cdot {}^-OH$

(2) H_3O^+

(3) $Hg(OAC)_2 / NaBH_4, NaOH$

(4) None

74. m-cresol on bromination gives :

(1)

(2)

(3)

(4)
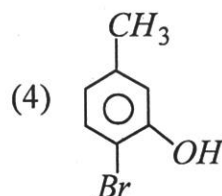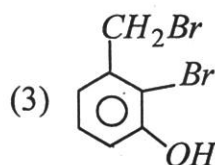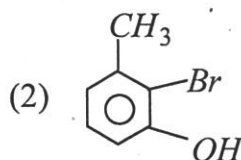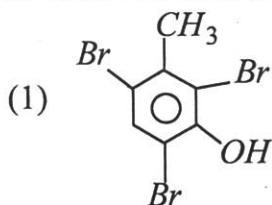
75. Dipole moment is shown by :

(1) 2, 2-dimethylpropane

(2) Trans-2-pentene

(3) Trans-1,2-dichloroethene

(4) 2, 2, 3, 3-tetrabromobutane

76. Which of the following does not give white precipitate when boiled with alcoholic silver nitrate ?

(1) Methyl chloride

(2) Carbon tetrachloride

(3) Benzyl chloride

(4) Vinyl chloride

77. The formation of cyanohydrin from a ketone is an example of :

(1) Electrophilic addition

(2) Nucleophilic addition

(3) Electrophilic substitution

(4) Nucleophilic substitution

C

78. When acetaldehyde is heated with Fehling solution it gives a precipitate of :

(1) Cu (2) CuO (3) Cu_2O (4) Cu, CuO, Cu_2O

79. In the cannizaro reaction given below

$$2PhCHO \xrightarrow{\ominus OH} PhCH_2OH + PhCOO^{\ominus}, \text{ the slowest step is :}$$

(1) Attack of $^\ominus OH$ at the carbonyl group

(2) Transfer of hydride to carbonyl group

(3) The abstraction of proton from carboxylic acid

(4) The deprotonation of $PhCH_2OH$

80. Which of the following carboxylic acids undergo decarboxylation easity ?

(1) $C_6H_5COCH_2COOH$ (2) $C_6H_5COCOOH$

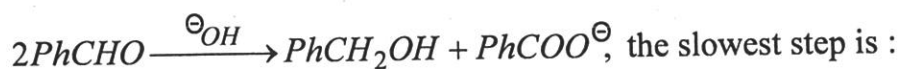(3) $C_6H_5CH(OH)COOH$ (4) $C_6H_5CH(NH_2)COOH$

81. The aqueous solution of which of the following has maximum pH ?

(1) $NaClO$ (2) $NaClO_2$

(3) $NaClO_3$ (4) $NaClO_4$

82. Which one of the following compounds will exhibit linkage isomerism ?

(1) $[Pt(NH_3)_2Cl_2]$ (2) $[Co(NH_3)_5NO_2]Cl_2$

(3) $[Co(NH_3)_4Cl_2]Cl$ (4) $[Co(en)_2Cl_2]Cl_2$

83. Which oxide of vanadium is most likely to be basic and ionic ?

(1) VO (2) V_2O_3 (3) VO_2 (4) V_2O_5

84. Which of the following complex is non-ionisable ?

(1) $CoCl_3 . 6NH_3$ (2) $CoCl_3 . 5NH_3$

(3) $CoCl_3 . 4NH_3$ (4) $CoCl_3 . 3NH_3$

85. EAN (Effective Atomic No.) of Fe^{2+} ion in $[Fe^{2+}(CN_6)]^{4-}$ is equal to :

(1) 26   (2) 36   (3) 18   (4) 54

86. Which is used in cancer chemotherapy ?

(1) Zeise's salt   (2) Auranofin

(3) Cisplatin   (4) None

87. Which pairing is **wrong** ?

(1) $[Fe(H_2O)_6]^{2+}$ – Paramagnetic

(2) $[Fe(CN)_6]^{4-}$ – Paramagnetic

(3) $[CoF_6]^{3-}$ – Paramagnetic

(4) $Ni(CO)_4$ – Diamagnetic

88. Formula of pitch blende is :

(1) UO_2 (2) U_3O_8 (3) UF_4 (4) None of these

89. Which one of the following is the best method of preparation of acetophenone ?

(1) $PhCOOEt + CH_3MgBr \rightarrow$ (2) $PhCOCl + CH_3MgBr \rightarrow$

(3) $PhCONH_2 + CH_3MgBr \rightarrow$ (4) $PhCN + CH_3MgBr \rightarrow$

90. Dilute HCl is used to separate following radical :

(1) Ag^+ (2) Ca^{2+} (3) Sn^{2+} (4) Ba^{2+}

91. The critical temperature of a liquid having boiling point 73°C is :

(1) 246°C   (2) 219°C   (3) 182°C   (4) None of these

92. Which of the following will show an ESR spectrum ?

(1) Cu^+ ion   (2) N_2 molecule

(3) Cu^{2+} ion   (4) CH_4 molecule

93. The ESR spectrum could be used to map molecular orbital by unpaired electron, which is aided by McConnel equation. The said equation is :

(1) $Q = a\rho$ (2) $Q = a + \rho$ (3) $a = Q\rho$ (4) $Q = a - \rho$

where ρ is the unpaired electron density on carbon atom and a is hyperfine splitting constant.

C.

94. The molecule which is IR inactive and Raman active is :

(1) Protein   (2) HCl (3) SO_2 (4) N_2

95. The pH of an aqueous solution of 1×10^{-7} M HCl is :

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96. When a beam of light is passed through a colloidal solution, it suffers :

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(1) C – H bending   (2) O – H stretching

(3) C = O stretching   (4) O – H bending

100. Strong covalent bonds exist between polymer chains in :

(1) Elastomers   (2) Thermoplasts   (3) Thermosets   (4) All polymers

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

CPG-EE-2019 (Chemistry)-(SET-X) 10360

D

Sr. No. ....

Time : **1½ Hours**　　　　Total Questions : **100**　　　　Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

_____　　　　　_____
(Signature of the Candidate)　　　　　　　　　　(Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are **compulsory** and carry equal marks. The candidates are required to attempt all questions.

2. The candidate **must return** this question booklet and the OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

4. Question Booklet along-with answer key of all the A, B, C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

5. The candidate **must not** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers **must not** be ticked in the question booklet.

6. *Use only black or blue ball point pen of good quality in the OMR Answer-Sheet.*

7. There will be **negative** marking. Each correct answer will be awarded **one** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ Mark (0.25 Mark) discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

8. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained **30** minutes after starting of the examination.*

CPG-EE-2019(Chemistry)-(SET-X)/(D)

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   (3) Propanone

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   The product in the reaction is :

   (1) ⬡—$COONa$

   (2) ⬡—CHO

   (3) ⬡—CH_2OH

   (4) ⬡—$COONa$ + ⬡—CH_2OH

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5. Stability of $(CH_3)_3 C^+$ can be explained by :

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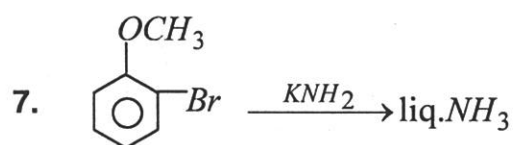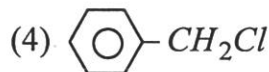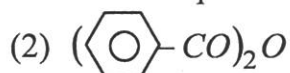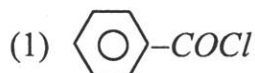
(1) ⟨O⟩–$COCl$

(2) (⟨O⟩–$CO)_2O$

(3) ⟨O⟩–Cl

(4) ⟨O⟩–CH_2Cl

7.

OCH_3
⟨O⟩–Br $\xrightarrow{KNH_2}$ liq.NH_3

The product obtained in above reaction is :

(1)
OCH_3
⟨O⟩
NH_2

(2)
OCH_3
⟨O⟩–NH_2

(3)
OCH_3
⟨O⟩
NH_2

(4)
⟨O⟩—⟨O⟩
OCH_3 OCH_3
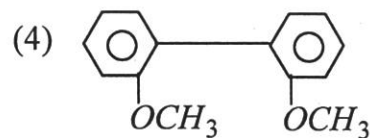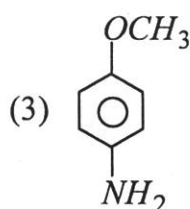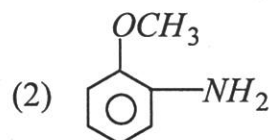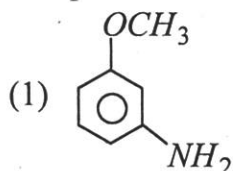
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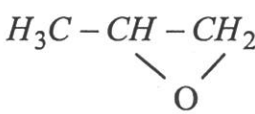
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(3) $CH_2 = CH - O - CH_3$

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                  \   /
                   O

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(1)

(2)
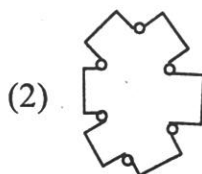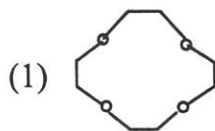
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    (1) Elastomers   (2) Thermoplasts

    (3) Thermosets   (4) All polymers

21. In synthesis of Grignards reagent, alkyl halide reacts with Mg in presence of :

    (1) An ester   (2) Dry ether

    (3) Alcohol   (4) Amide

22. The strongest acidic strength is that of :

    (1) C_2H_5OH (2) H_2O

    (3) HCN (4) Cl_3CCOOH

23. In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?

    (1) PCl_5 (2) SF_4 (3) I_3^- (4) $SbCl_5^{2-}$

24. The Compton wave length of an electron, λ_c is expressed as :

    (1) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{m}$ (2) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{2m}$ (3) $\dfrac{\lambda_c}{2\pi} = \dfrac{h}{mc}$ (4) $\dfrac{\lambda_c}{2\pi} = \dfrac{\hbar}{mc}$

25. If $\hat{A}$ and $\hat{B}$ are two operators such that $[\hat{A}, \hat{B}] = 1$, then value of $[\hat{A}, \hat{B}^2]$ is :

(1) $\hat{B}$ (2) $2\hat{B}$ (3) $\hat{A}$ (4) $2\hat{A}$

26. Which one of the following is *correct* relation ?

(1) $S = RlnW$ (2) $S = klnW$

(3) $C_p = \left(\dfrac{\partial H}{\partial T}\right)_V$ (4) $C_v = \left(\dfrac{\partial E}{\partial T}\right)_P$

(All the symbols have their usual meanings.)

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(1) $\dfrac{M_w}{M_n}$ (2) $\dfrac{M_n}{M_w}$

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Where M_w and M_n are mass-average molar mass and number-average molar mass of a polymer sample.

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6 D

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(1) VO
(2) V_2O_3
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(1) $CoCl_3 . 6NH_3$
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(2) Auranofin
(3) Cisplatin
(4) None

37. Which pairing is *wrong* ?

(1) $[Fe(H_2O)_6]^{2+}$ – Paramagnetic
(2) $[Fe(CN)_6]^{4-}$ – Paramagnetic
(3) $[CoF_6]^{3-}$ – Paramagnetic
(4) $Ni(CO)_4$ – Diamagnetic

38. Formula of pitch blende is :
(1) UO_2
(2) U_3O_8
(3) UF_4
(4) None of these

39. Which one of the following is the best method of preparation of acetophenone ?

(1) $PhCOOEt + CH_3MgBr \rightarrow$
(2) $PhCOCl + CH_3MgBr \rightarrow$
(3) $PhCONH_2 + CH_3MgBr \rightarrow$
(4) $PhCN + CH_3MgBr \rightarrow$

40. Dilute HCl is used to separate following radical :

(1) Ag^+
(2) Ca^{2+}
(3) Sn^{2+}
(4) Ba^{2+}

41. In benzilic acid rearrangement :

(1) Benzaldehyde is converted to benzoin

(2) Benzoin is converted to benzilic acid

(3) Benzilic acid is converted to benzoin

(4) Benzil is converted to benzilic acid

42. Grignard reagent shows addition on :

(1) $\overset{\backslash}{\underset{/}{C}} = O$ (2) $\overset{\backslash}{\underset{/}{C}} = S$ (3) $-C \equiv N$ (4) All

43. A positive carbylamine test is given by :

(1) N, N-Dimethylaniline

(2) 2-4- Dimethylaniline

(3) N, N-dimethyl-p-nitroaniline

(4) p-methyl benzylamine

44.

$$\xrightarrow[\substack{(ii) CO_2 / H_3O^{\oplus} \\ (iii) KMnO_4 / OH^- \\ (iv) \Delta}]{(i) Mg / Ether} A$$

A is :

(1)

(2)

(3)

(4)

45.

$$\xrightarrow[Warm]{H_2O}$$ Product

Product is :

(1) Picric acid   (2) Phenol

(3) Chlorobenzene   (4) No reaction since $(C - Cl)$ bond is stable

46.

$$\xrightarrow[(ii)\ H_3O^{\oplus}]{(i)\ HNO_2}\ A + B$$

A and B are :

(1) HO––NO, $(CH_3)_2 NH$ (2) HO––OH, $(CH_3)_2 NH$
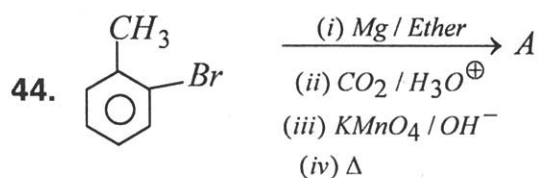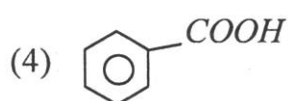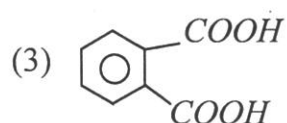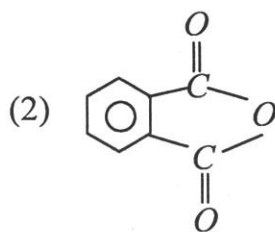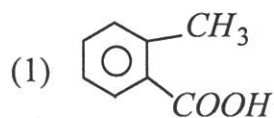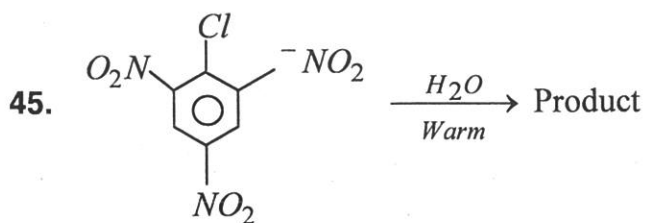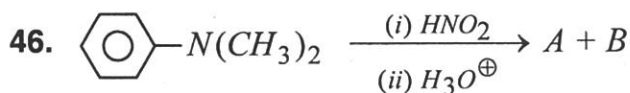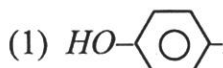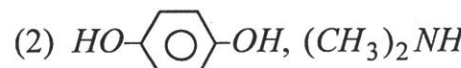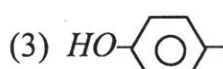
(3) HO––NO, $CH_3 CH_2 NH_2$ (4) None is correct

47. A β-hydroxy carbonyl compound is obtained by the action of $NaOH$ on :

(1) $R_3C\,.\,CHO$ (2) C_6H_5CHO (3) CH_3CHO (4) $HCHO$

48. Which have acidic H, but not reacting with $NaHCO_3$?

(1) CH_3COOH (2) $-OH$ (3) $CH_3\overset{\overset{O}{\|}}{C}CH_2CN$ (4) NH_3

49. Predominant product formed when HCl adds to 2,4-hexadiene is :

(1) 4-chloro-2-hexene   (2) 2-chloro-3-hexene

(3) 2-chloro-4-hexene   (4) 1-chloro-2-hexene

50. Electrophile $NO_2^{\oplus}$ attacks the following :

In which cases $NO_2^{\oplus}$ will be at meta position :

(1) II and IV
(2) I, II and III
(3) II and III only
(4) I only

51. Which of the following statements about tetramethylsilane is **incorrect** ?

(1) It is Inert

(2) It is used to provide a reference against which other peaks are measured

(3) It is volatile and can be easily distilled off and used again

(4) It produces a single peak at $\delta = 10$

52. The ionic strength of 0.25 molal K_2SO_4 solution will be :

(1) 0.25
(2) 0.50
(3) 0.75
(4) 0.60

53. Debye-Hückel limiting law equation relates :

(1) Activity coefficient with ionic strength of the solution

(2) Mean ionic coefficient with ionic strength of the solution

(3) Activity coefficient with square of the ionic strength of the solution

(4) None of these

54. 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

55. In the phenomenon of Larmor pression, the angular frequency of pression, "Larmor frequency" is expressed as :
    (1) $w = r + B_z$ (2) $w = r - B_z$ (3) $w = r / B_z$ (4) $w = rB_z$

    where $r = \dfrac{\mu}{I(h/2\pi)}$ and all the notations have usual meanings.

56. Which of the following relations represent Clasius-Claypeyron equation ?

    (1) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = -\dfrac{H}{T^2}$ (2) $\left[\dfrac{\partial}{\partial T}(G/T)\right]_P = H$

    (3) $\dfrac{\partial}{\partial T} ln k_P = \dfrac{\Delta H^\circ}{RT^2}$ (4) $\dfrac{\partial}{\partial T} ln P = \dfrac{\Delta H^\circ_{vaporization}}{RT^2}$

57. Which of the following reaction involves rearrangement of nitrogen yields ?

    (1) Wittig reaction   (2) Von-Richter reaction

    (3) Sommlet-Hauser reaction   (4) Pinacol-Pinacolone rearrangement

58. Following pair of compounds are :
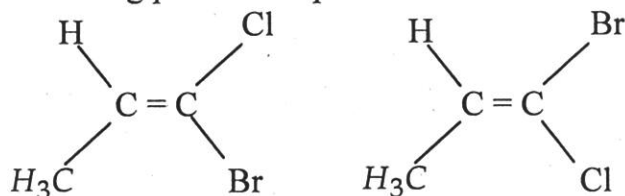
    (1) Enantiomers   (2) Diastereomers

    (3) Geometrical isomers   (4) Homomers

59. Absolute configuration of :
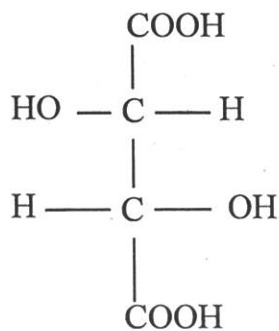
    (1) 2S, 3S   (2) 2R, 3R   (3) 2S, 3R   (4) 2R, 3S

60. Which among the following reagents gives syn addition with alkenes :

I Br_2 II Dil $KMnO_4$ / ^-OH

III OSO_4 / $NaSO_3H$ / H_2O IV H_2 /Ni/Δ
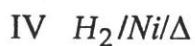
Select the answer from the codes given below :

(1) Only I (2) II and III (3) II, III and IV (4) Only IV

61. Allylic halogen substitution can be done with :

(1) Halogen at high temperature

(2) NBS in sunlight

(3) Sulphuryl chloride in sunlight

(4) All of these

62. Allylic alcohol is obtained when glycerol reacts with the following at 260°C :

(1) Formic acid (2) Oxalic acid (3) Both (4) None

63. $(CH_3)_3C-CH=CH_2 \xrightarrow{X} (H_3C)_3C-\underset{\underset{.OH}{|}}{CH}-CH_3$ X can be :

(1) BH_3 . THF / H_2O_2 . ^-OH (2) H_3O^+

(3) $Hg(OAC)_2$ / $NaBH_4$, $NaOH$ (4) None
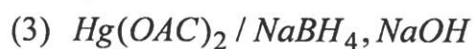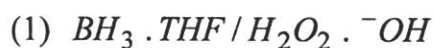
64. m-cresol on bromination gives :

(1)

(2)

(3)

(4)
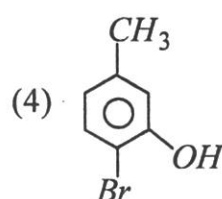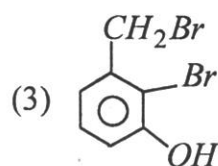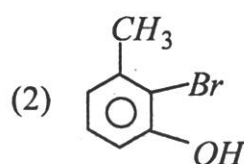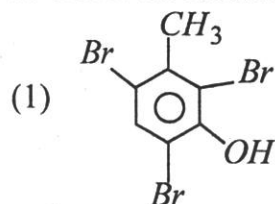
65. Dipole moment is shown by :

   (1) 2, 2-dimethylpropane

   (2) Trans-2-pentene

   (3) Trans-1,2-dichloroethene

   (4) 2, 2, 3, 3-tetrabromobutane

66. Which of the following does not give white precipitate when boiled with alcoholic silver nitrate ?

   (1) Methyl chloride

   (2) Carbon tetrachloride

   (3) Benzyl chloride

   (4) Vinyl chloride

67. The formation of cyanohydrin from a ketone is an example of :

   (1) Electrophilic addition

   (2) Nucleophilic addition

   (3) Electrophilic substitution

   (4) Nucleophilic substitution

68. When acetaldehyde is heated with Fehling solution it gives a precipitate of :

   (1) Cu
   (2) CuO
   (3) Cu_2O
   (4) Cu, CuO, Cu_2O

69. In the cannizaro reaction given below

   $$2PhCHO \xrightarrow{\ominus OH} PhCH_2OH + PhCOO^{\ominus},$$ the slowest step is :

   (1) Attack of $^{\ominus}OH$ at the carbonyl group

   (2) Transfer of hydride to carbonyl group

   (3) The abstraction of proton from carboxylic acid

   (4) The deprotonation of $PhCH_2OH$

70. Which of the following carboxylic acids undergo decarboxylation easity ?

   (1) $C_6H_5COCH_2COOH$

   (2) $C_6H_5COCOOH$

   (3) $C_6H_5CH(OH)COOH$

   (4) $C_6H_5CH(NH_2)COOH$

71. The internal pressure of an ideal gas is :

   (1) zero
   (2) infinite
   (3) 1
   (4) None of these

72. The standard state for a solid is :

(1) Pure state of the solid at one atmospheric pressure

(2) Pure state of the solid at one atmospheric pressure and 273 K temperature

(3) Pure state of the solid at one atmospheric pressure and 298 K temperature

(4) Pure state of the solid at one atmospheric pressure at any given temperature

73. The Millar indices of crystal planes cut through the crystal axis at ($2a$, $3b$, c) are :

(1) (1 2 2)   (2) (2 3 6)   (3) (6 3 2)   (4) (3 2 6)

74. Which one of the following statements is *true* ?

(1) Work is a state function.

(2) Entropies are additive and probabilities are multiplicative.

(3) Entropies are multiplicative and probabilities are additive.

(4) The entropy possessed by substance at 298 K is called residual Entropy.

75. A liquid is in equilibrium with its vapours at its boiling point. The molecules in the two phases have the same :

(1) Chemical potential   (2) Enthalpy

(3) Entropy   (4) None of these

76. In which of the following reactions, the collision theory of reactions rate is valid ?

(1) Reaction between two diatomic molecules

(2) Reaction between an atom and a diatomic molecule

(3) Reaction between two complex molecules

(4) Reaction between two atoms

77. The cell potential is a/an :

(1) Colligative property   (2) Thermodynamic property

(3) Extensive property   (4) Intensive property

78. For an isentropic change of state :

(1) $dS = 0$ (2) $dS = 1$ (3) $dH = 0$ (4) None of these

79. Isotonic solutions have same :

(1) Viscosity   (2) Surface tension

(3) Freezing point   (4) Osmotic pressure

80. The rotational spectrum of a rigid diatomic rotator is comprised of equally spaced lines with spacing equal to :

(1) B (2) $2B$ (3) $2.5B$ (4) $3B$

81. Wilson disease is caused by the excess of :

(1) Zinc   (2) Copper   (3) Magnesium   (4) Lead

82. In the compound $Fe_4[Fe(CN)_6]$ the respective oxidation states of Fe are :

(1) II, III   (2) II, II   (3) III, II   (4) III, III

83. In vitro reaction of excess of O_2 with free heme B in aqueous medium, end product is :

(1) Hematin

(2) Heme B CO_2

(3) $[O_2^- - Fe(III) - protoporphyrin - IX]$

(4) All of these

84. The main reason for larger number of oxidation states exhibited by the actinoids than the corresponding lanthanoids is :

(1) More energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(2) Lesser energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(3) Larger atomic size of actinoids than the lanthanoids.

(4) Greater reactive nature of actinoids than the lanthanoids.

85. Which of the following has zero dipole moment ?

(1) ClF (2) PCl_3 (3) SiF_4 (4) $CFCl_3$

86. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is :

(Atomic Nos. Y = 39, La = 57, Eu = 63, Lu = 71)

(1) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (2) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

(3) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (4) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

87. $AgCl$ is soluble in ammonia due to the formation of :

(1) $Ag(NH_2)Cl$ (2) $[Ag(NH_3)_2]Cl$ (3) $AgNH_2$ (4) $NH_4[AgCl(NH)_2]$

88. Hydrogen directly combines with :

(1) Au (2) Cu (3) Ni (4) Ca

89. Which is used in filling cavities in teeth ?

(1) $Cu\,(Hg)$ (2) $Ag\,(Hg)$ (3) $Zn\,(Hg)$ (4) $Ni\,(Hg)$

90. Mg^{2+} is prepared in photosynthesis by chlorophyll because :

(1) It has strong spin-orbit coupling

(2) It has weak spin-orbit coupling

(3) It is a heavy metal

(4) It binds strongly with chlorophyll

91. Which of the following has least de-Broglie wavelength ?

(1) e^- (2) p (3) CO_2 (4) SO_2

92. The geometry of AsF_5 is :

(1) Pyramidal   (2) Tetrahedral

(3) Trigonal bipyramidal   (4) Octahedral

93. The effective nuclear charge at the periphery of Cr atom, using slater rule is :

(1) 3.35   (2) 3.70   (3) 1.70   (4) 2.60

94. The theoretical value of magnetic moment of Gd^{3+} is :

(1) 7.94   (2) 9.72   (3) 9.57   (4) 7.63

95. Which of the following will *not* show H-bonding ?

(1) HF (2) NH_3 (3) H_2O (4) CH_4

96. The oxide which gives H_2O_2 on treatment with dilute acid is :

(1) PbO_2 (2) Na_2O_2 (3) MnO_2 (4) TiO_2

97. Inorganic benzene is :

(1) BH_3OH_3 (2) $B_3N_3H_6$

(3) B_2H_6 (4) B_4H_{10}

98. The correct order of increasing size is :

(1) $Na^+ < Li^+ < Be^{2+} < B^{3+}$ (2) $B^{3+} < Be^{2+} < Li^+ < Na^+$

(3) $Be^{2+} < B^{3+} < Na^+ < Li^+$ (4) $Li^+ < Na^+ < B^{3+} < Be^{2+}$

99. Addition of *As* in trace amounts to pure *Ge* will result in the formation of :

(1) n-type semiconductor   (2) Germanium arsenic

(3) p-type semiconductor   (4) Super conducting-alloy

100. Freon is :

(1) CCl_3H (2) CF_4

(3) CF_3H_3 (4) CCl_2F_2

Answer key of CHEMISTRY (Centralized Entrance Exam 2019)

Question No.	A	B	C	D
1	4	1	1	2
2	3	2	4	3
3	4	1	2	4
4	1	4	2	2
5	4	2	1	4
6	2	3	4	3
7	2	2	4	1
8	2	2	1	2
9	1	2	4	1
10	4	1	2	2
11	1	4	2	2
12	2	4	3	3
13	1	4	1	3
14	4	2	2	4
15	2	1	3	2
16	3	1	2	3
17	2	3	2	1
18	2	2	4	4
19	2	2	2	3
20	1	2	2	3
21	2	2	4	2
22	3	3	3	4
23	1	4	4	4
24	2	2	1	4
25	3	4	4	2
26	2	3	2	2
27	2	1	2	1
28	4	2	2	1
29	2	1	1	2
30	2	2	4	3
31	2	2	4	1
32	4	3	4	2
33	4	3	4	1
34	4	4	2	4
35	2	2	1	2
36	2	3	1	3
37	1	1	3	2
38	1	4	2	2
39	2	3	2	2
40	3	3	2	1
41	1	2	4	4

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Answer key of CHEMISTRY (Centralized Entrance Exam 2019)

Question No.	A	B	C	D
42	4	4	3	4
43	2	4	2	4
44	2	4	1	2
45	1	2	4	1
46	4	2	4	1
47	4	1	3	3
48	1	1	3	2
49	4	2	2	2
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51	2	2	2	4
52	3	3	4	3
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75	4	4	2	1
76	3	4	4	4
77	1	3	2	4
78	2	3	3	1
79	1	2	2	4
80	2	3	1	2
81	4	4	1	2
82	3	3	2	3

Answer key of CHEMISTRY (Centralized Entrance Exam 2019)

Question No.	A	B	C	D
83	3	4	1	1
84	1	1	4	2
85	2	4	2	3
86	4	2	3	2
87	2	2	2	2
88	3	2	2	4
89	2	1	2	2
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99	2	2	3	1
100	2	1	3	4