

COMMON P. G. ENTRANCE TEST – 2023 (CPET-2023)

Test Booklet No. :

0384Subject Code : **05**Hall Ticket No. : Subject : **CHEMISTRY****TEST BOOKLET****Time Allowed : 60 Minutes****Full Marks : 80****: INSTRUCTIONS TO CANDIDATES :**

1. The Test Booklet contains **16** pages including the cover page and **80** (Question No. 1 to 80) multiple choice questions.
2. DO NOT break the seal of the Test Booklet until the invigilator instructs to do so.
3. The candidates must check discrepancy, if any (like up-printed or torn or missing pages or missing questions) in the Test Booklet immediately after breaking the seal of the Test Booklet. If detected; the invigilator may be requested to replace the same.
4. Candidates are required to fill up and darken the **Hall Ticket No, Test Booklet Serial No. and OMR Answer Sheet Serial No.** in attendance sheet carefully. Wrongly filled in OMR Answer Sheet is liable for rejection.
5. Each question has four choices / answers marked (A), (B), (C), (D). Candidate has to select the most appropriate choice / answer to each question and darken the oval completely against the question number provided in the OMR Answer Sheet.
6. Indicate only one choice / answer from the options provided by darkening the appropriate oval in the OMR Answer Sheet. More than one response to a question shall be treated as a wrong answer.
7. Use only **Black Ball Point Pen** for darkening the oval for answering.
8. All the questions are compulsory and they carry equal marks. The total marks scored by a candidate depends on the number of correct choices / answers darkened in the OMR Answer Sheet. There will be no negative marking for wrong answers.
9. No candidate shall be allowed to leave the Examination Hall / Room till all OMR Answer Sheets have been collected by the invigilator.
10. On completion of the entrance test, the original OMR Answer Sheet be handed over to the invigilator. Candidates are allowed to take the second copy of the OMR Answer Sheet along with the used Test Booklet for reference.
11. Candidates are not allowed to carry any personal belongings including electronic devices such as scientific calculator, cell phones, headphones, ear buds, or any other type of devices that allow communication of any kind inside the Examination Room / Hall.
12. The candidates are advised not to scribble or make any mark on the OMR Answer Sheet except marking the answers at the appropriate places and filling up the details required. Rough work, if any, may be done in the blank sheet(s) provided at the end of the Test Booklet.
13. Any malpractice / use of unfair means will lead to your disqualification from the entrance test / admission process and may also lead to appropriate legal action as deemed fit.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

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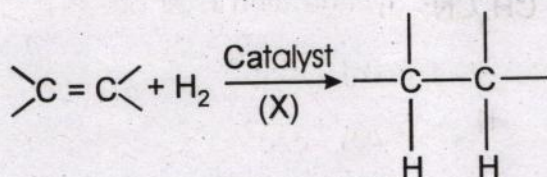
TEST BOOKLET

aglasem

- An orbital is described by _____ quantum numbers.
 (A) n and l (B) n, l and m
 (C) n, l, m and s (D) n, l and s
- The lattice energy is the sum of the attractive and repulsive forces. For one gram molecule the total repulsive force is given by :
 (where the terms have their usual meaning ; n is Born exponent)
 (A) $N_0 B / r^n$ (B) $N_0 B / r$
 (C) B / r^n (D) B / r
- The structure of SF_4 molecule is _____, it contains _____ lone pair(s) and _____ bond pair(s) of electrons.
 (A) Triagonal bipyramid, 1, 2 (B) Triagonal bipyramid, 1, 4
 (C) Tetrahedral, 1, 4 (D) Square planar, 1, 4
- Which of the following ionization processes has the positive electron affinity value ?
 (A) $\text{H} \rightarrow \text{H}^-$ (B) $\text{Al} \rightarrow \text{Al}^-$
 (C) $\text{O} \rightarrow \text{O}^-$ (D) $\text{N} \rightarrow \text{N}^-$
- Which of the following borohydride compounds is least stable in water ?
 (A) $\text{Li}[\text{BH}_4]$ (B) $\text{Na}[\text{BH}_4]$
 (C) $\text{Be}[\text{BH}_4]_2$ (D) $\text{K}[\text{BH}_4]$
- CO_2 is a :
 (A) Soft acid (B) Hard acid
 (C) Soft base (D) Hard base
- XeF_4 is _____ in shape and contains _____ lone pairs of electrons.
 (A) Tetrahedral and two (B) Square planar and three
 (C) Tetrahedral and three (D) Square planar and two

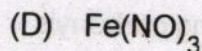
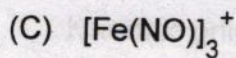
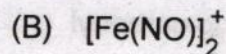
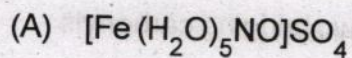
8. Which of the followings is FALSE about alkali metal hydrides ?
- (A) Alkali metal hydrides are ionic in nature
 - (B) Alkali metal hydrides have rock salt structure
 - (C) Alkali metal hydrides react violently with water
 - (D) Alkali metal hydrides are useful oxidants
9. The crystal field stabilization energy of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ is :
- (A) $-0.4 \Delta_0$
 - (B) $-0.6 \Delta_0$
 - (C) $+0.6 \Delta_0$
 - (D) $+0.4 \Delta_0$
10. According to the valence bond theory, the hybridization in ferrocene is :
- (A) sp^3d^2
 - (B) d^2sp^3
 - (C) sp^3d
 - (D) dsp^2
11. Chromate species are strongly yellow colored and the color is due to _____ transitions.
- (A) $\text{M} \rightarrow \text{L}$ charge transfer
 - (B) $\text{L} \rightarrow \text{M}$ charge transfer
 - (C) d-d
 - (D) p-d
12. The ground state term symbol for $\text{Pr}^{3+} (f^2)$ is $^3\text{H}_4$ with $L = 5$, $S = 1$ and $J = 4$, then magnetic moment is _____ μ_B .
- (A) 3.58
 - (B) 1
 - (C) $2\sqrt{3}$
 - (D) $\sqrt{6}$
13. Which of the followings is TRUE with respect to myoglobin ?
- (A) Deoxymyoglobin is bluish red and contains Fe(III)
 - (B) Oxymyoglobin is bright red in color
 - (C) Myoglobin reversibly binds to CO_2 in tissue
 - (D) The iron in deoxymyoglobin is five coordinate and low spin

14. $\text{Fe}_2(\text{CO})_9$ has :
- (A) One bridging carbonyl (B) Two bridging carbonyls
(C) Three bridging carbonyls (D) Zero bridging carbonyl
15. Which of the following elements has been extremely studied for square planar substitution reaction?
- (A) Pd(II) (B) Ni(II)
(C) Pt(II) (D) Au(II)
16. Identify the catalyst (X) in the following reaction.

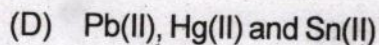
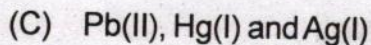
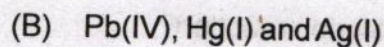
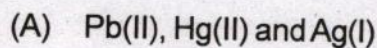


- (A) $\text{IrCl}(\text{PPh}_3)_3$ (B) $\text{RhCl}(\text{PPh}_3)_3$
(C) $\text{RuHCl}(\text{PPh}_3)_3$ (D) $\text{Ni}(\text{CO})_4$
17. 1.0 L of 18 Molar H_2SO_4 has been diluted to 100 L, the normality of the resulting solution is :
- (A) 0.09 N (B) 0.18 N
(C) 1800 N (D) 0.36 N
18. Cuprous oxide is _____ in color.
- (A) Violet (B) Black
(C) Red (D) Green
19. An example of olefin complex is :
- (A) Ferrocene (B) Zeise salt
(C) $\text{Bis}(\eta^6\text{-benzene})$ chromium (D) $(\text{CO})_6\text{Co}_2(\text{PhC}\equiv\text{CPh})$

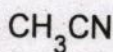
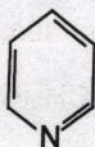
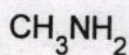
20. The brown ring formed during test for nitrate has the chemical formulae of :



21. The group I cations are :



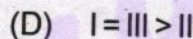
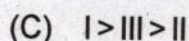
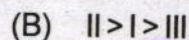
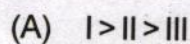
22. The correct order of the basicity of the given compounds is :



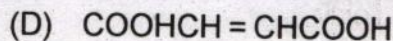
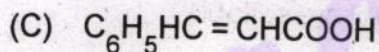
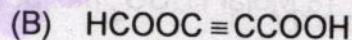
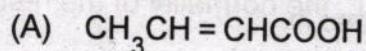
I

II

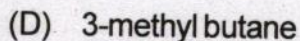
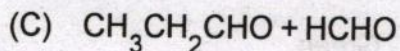
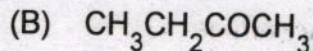
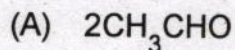
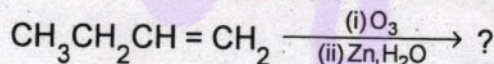
III



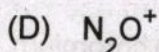
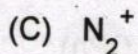
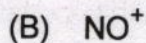
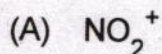
23. Which of the following compounds does not exist in diastereoisomeric form ?



24. Predict the product(s) of the following reaction.



25. Which of the followings is an important reactive electrophile in aromatic ring nitration ?



26. Which reagents would be the best for achieving an E2 elimination of 3-chloropentane ?
- (A) CH_3COONa (B) NaHCO_3
 (C) NaI (D) $\text{C}_2\text{H}_5\text{ONa}$
27. Identify 'X' and 'Y'
- $$\text{C}_6\text{H}_5\text{OH} \xrightarrow[\text{(ii) Y}]{\text{(i) X}} \text{C}_6\text{H}_4(\text{OH})\text{CHO}$$
- (A) $\text{X} = \text{CO}_2$; $\text{Y} = 125 - 140^\circ\text{C}$ (B) $\text{X} = \text{AlCl}_3$; $\text{Y} = \text{Heat}$
 (C) $\text{X} = \text{H}_2\text{O}_2$; $\text{Y} = \text{NaOH}$ (D) $\text{X} = \text{CHCl}_3 / \text{NaOH}$; $\text{Y} = \text{HCl}$
28. Which of the following aldehydes used alone will undergo aldol reaction ?
- (A) CH_2O (B) $\text{CH}_3(\text{CH}_2)_2\text{CHO}$
 (C) $\text{C}_6\text{H}_5\text{CHO}$ (D) $\text{CH}_2 = \text{CHCHO}$
29. Which of the following reagents are suitable for reduction of an acylchloride to an aldehyde ?
- I. LiAlH_4 in ether II. NaBH_4 in ter-butanol
 III. $\text{Li}(\text{ter-C}_4\text{H}_9\text{O})_3\text{AlH}$ IV. H_2 and Pd/BaSO_4
 (A) III and IV (B) I and IV
 (C) I only (D) All are suitable
30. A particular N-containing organic compound was treated with NaNO_2/HCl at 0°C , and a water insoluble yellow oil was produced, the likely compound was :
- (A) Primary amine (B) Secondary amine
 (C) Tertiary amine (D) Amide
31. Iodobenzene can be prepared by :
- (A) Treating chlorobenzene with I_2 using FeCl_3 as catalyst
 (B) Treating phenol with I_2 in NaOH solution
 (C) Treating benzene diazonium chloride with KI
 (D) Treating benzene with CH_3I using AlCl_3 catalyst

32. Anthracene undergoes electrophilic substitution reactions mainly at :
 (A) C-1 (B) C-2
 (C) C-9 (D) C-1 and C-2
33. Which of the followings is not a fused ring system ?
 (A) Benzopyrene (B) Biphenyl
 (C) Anthracene (D) Naphthalene
34. Which of the following reagents will react with pyrrole to form 2-formylpyrrole ?
 (A) HCOOH (B) $\text{CHCl}_3 / \text{KOH}; \text{H}_3\text{O}^+$
 (C) H_2O_2 (D) $(\text{CH}_3\text{CO})_2\text{O} / \text{SnCl}_4$
35. What constitutes a terpene 'head' ?
 (A) A branched alkyl group (B) A carboxylate group
 (C) A $\text{C} = \text{C}$ double bond (D) An aldehyde group
36. The helix is a common form of :
 (A) Quarternary structure (B) Tertiary structure
 (C) Secondary structure (D) Primary structure
37. Soap is manufactured by reaction of triglycerides with :
 (A) H_2SO_4 and water (B) NaOH and water
 (C) NH_3 and water (D) HCl and water
38. In 'Lucas test' one combines an unknown alcohol with 'Lucas reagent' to distinguish among primary, secondary and tertiary alcohols. Which alcohol reacts the fastest and by what mechanism ?
 (A) Secondary alcohol and $\text{S}_{\text{N}}2$ (B) Tertiary alcohol and $\text{S}_{\text{N}}1$
 (C) Secondary alcohol and $\text{S}_{\text{N}}1$ (D) Tertiary alcohol and $\text{S}_{\text{N}}2$
39. Predict which of the following compounds will have a lower boiling point than 1-butanol ?
 (A) 1-butanol (B) 2-butanol
 (C) 1-butene (D) Butanoic acid

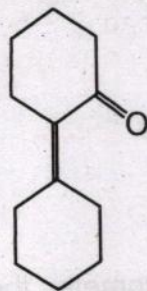
40. A reagent that can be used to differentiate aldose and ketose is :

- (A) Fehling solution (B) Tollen's reagent
(C) Bromine water (D) Nitric acid

41. Which of the followings is TRUE for ^1H -NMR of benzene ?

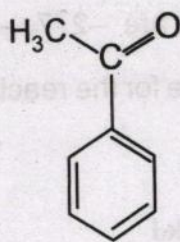
- (A) All six protons are both chemically and magnetically equivalent
(B) All six protons are both chemically and magnetically inequivalent
(C) Protons around the periphery of the ring resonates at higher δ value
(D) Protons held above or below the plane of ring resonates at higher δ value

42. Predict the λ_{max} for an absorption band in the UV-spectrum of the given compound :

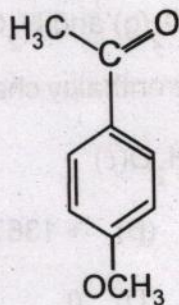


- (A) 247 nm (B) 245 nm
(C) 259 nm (D) 225 nm

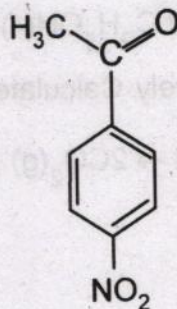
43. Pick the correct order of ν_{CO} (carbonyl stretching frequency) of the given compounds :



(I)



(II)



(III)

(A) III > I > II

(C) II > I > III

(B) I > II > III

(D) I > II $\approx$ III

44. Which of the following statements is TRUE, when hydrogen and oxygen gases are considered ?
- (A) At every temperature hydrogen has C_{rms} four times higher than that of oxygen
 - (B) At every temperature both hydrogen and oxygen have same average kinetic energies
 - (C) At every temperature both hydrogen and oxygen have same pressure
 - (D) Only (A) and (B)
45. The defects found in NaCl is :
- (A) Stoichiometric, both Schottky and Frenkel types
 - (B) Non-stoichiometric
 - (C) Stoichiometric, Schottky type
 - (D) Stoichiometric, Frenkel type
46. When a student was given a viscometer, the liquid was sucked with difficulty, the liquid may be :
- (A) Benzene
 - (B) Toluene
 - (C) Water
 - (D) Glycerine
47. Enthalpies of formation of $C_2H_5OH(l)$, $CO_2(g)$ and $H_2O(l)$ are -277 , -393.5 and $-285.8 \text{ kJmol}^{-1}$, respectively. Calculate the enthalpy change for the reaction :
- $$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$$
- (A) -1367.4 kJ
 - (B) $+1367.4 \text{ kJ}$
 - (C) -1644.4 kJ
 - (D) 0
48. Which of the followings is not an extensive property ?
- (A) Energy
 - (B) Heat capacity
 - (C) Molar volume
 - (D) Entropy

49. Indicate the incorrect expression :

(A) $\Delta A = \Delta U - T\Delta S$

(B) $\Delta G = \Delta H - T\Delta S$

(C) $\Delta S = R \ln W$

(D) $-\Delta G^\circ = RT \ln K$

50. For a closed system $(\delta G/\delta T)_{P,n} =$ _____

(A) V

(B) $-S$

(C) S

(D) μ

51. When a bottle of soda water is opened, the partial pressure of CO_2 :

(A) Decreases

(B) Increases

(C) Remains the same

(D) Attains equilibrium

52. The density of an equilibrium mixture of N_2O_4 and NO_2 at 1 atm and 348 K is 1.84 g L^{-1} . Calculate K_c for the equilibrium, $\text{N}_2\text{O}_4(\text{g}) \leftrightarrow 2\text{NO}_2(\text{g})$:

(A) 0

(B) 3

(C) 9

(D) 4

53. 10 g of a non-volatile solute when dissolved in 100 g of benzene raises its boiling point by 1° , what is the molecular mass of the solute (k_b for benzene = 2.53 K mol^{-1}).

(A) 253

(B) 2530

(C) 25.3

(D) 235

54. The rate constant for a reaction of zero order in A is $0.003 \text{ mol L}^{-1} \text{ s}^{-1}$. How long will it take for the initial concentration of A to fall from 0.1 to 0.075 M?

(A) 1.53 s

(B) 8.33 s

(C) 3.33 s

(D) 5.33 s

55. A catalyst is a substance :
- (A) Increases the equilibrium concentration of the product
 - (B) Changes the equilibrium constant of the reaction
 - (C) Supplies energy to the reaction
 - (D) Shortens the time to attain equilibrium
56. Kohlrausch's law can be used to determine :
- (A) λ_{∞} for weak electrolytes
 - (B) Absolute ionic velocities
 - (C) Solubility of a sparingly soluble salt
 - (D) All of these
57. An example of a basic buffer is a solution of :
- (A) $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$
 - (B) $\text{NH}_4\text{OH} + \text{HCl}$
 - (C) $\text{CH}_3\text{COONH}_4$
 - (D) $\text{NH}_4\text{OH} + \text{NaOH}$
58. When a conductometric titration of HCl vs NaOH is performed, the end point refers to :
- (A) Zero conductance
 - (B) Maximum conductance
 - (C) Minimum conductance
 - (D) Infinite conductance
59. The pH of a solution of strong acid and weak base at equivalence point is :
- (A) 7
 - (B) More than 7
 - (C) Less than 7
 - (D) 0
60. The average value of the linear momentum of a particle in one dimensional box with quantum number 'n' is :
- (A) $+kh/2\pi$
 - (B) $-kh/2\pi$
 - (C) 0
 - (D) $nh/2L$
61. The value of the commutator $[d/dx, X]$ is :
- (A) 0
 - (B) 1
 - (C) X
 - (D) X^2

62. The degeneracy of a rotational energy state having $J = 3$ is :
 (A) 6 (B) 7
 (C) 9 (D) 3
63. Which one is the weakest Raman spectral lines ?
 (A) Stokes line (B) Rayleigh line
 (C) Anti-Stokes line (D) None of these
64. The selection rule for observing P-branch in vibration-rotation spectra is :
 (A) $\Delta v = 0, \Delta J = +1$ (B) $\Delta v = 0, \Delta J = 0$
 (C) $\Delta v = 1, \Delta J = +1$ (D) $\Delta v = 1, \Delta J = -1$
65. Which of the following processes is non-radiative in nature ?
 (A) Fluorescence (B) Phosphorescence
 (C) Vibrational relaxation (D) Photo-luminescence
66. Automobile exhaust contains :
 (A) CO_x, NO_x and SO_x (B) $\text{CO}_2, \text{CH}_4, \text{CO}$
 (C) $\text{CO}, \text{NO}, \text{H}_2\text{O}$ (D) $\text{SO}_2, \text{O}_3, \text{NO}$
67. The major component of natural gas is :
 (A) Propane (B) Butane
 (C) Methane (D) Iso-butane
68. The major composition of glass used in manufacture of laboratory glassware is _____
 (A) $\text{SiO}_2, \text{Al}_2\text{O}_3$ (B) $\text{SiO}_2, \text{Na}_2\text{O}$
 (C) SiO_2, CaO (D) $\text{SiO}_2, \text{B}_2\text{O}_3$
69. Which of the following fertilizers (nitrogenous) is not made from ammonia ?
 (A) Ammonium sulphate (B) Urea
 (C) Calcium cyanamide (D) Calcium ammonium nitrate

70. Red lead is :
- (A) PbO (B) $\text{Pb}(\text{CO}_3)_2$
(C) $\text{Pb}(\text{OH})_2$ (D) Pb_3O_4
71. Which of the followings can be used as an ion-exchanger ?
- (A) Clays (B) Zeolite
(C) Cross linked polymers (D) All of these
72. Stainless steel contains :
- (A) Co, Ni, C (B) Cr, Ni, C
(C) Cr, Ni, Co (D) Zn, Ni, C
73. Which of the following compounds can act as a greener alternative to phosgene for synthesis of carbaryl ?
- (A) Acetic anhydride (B) Acetyl chloride
(C) Dimethyl carbonate (D) N,N-dimethyl urea
74. Which of the following solvents can be used as a medium during Microwave assisted synthesis ?
- (A) Water (B) Hexane
(C) Benzene (D) Ether
75. Which of the followings is not a greener solvent ?
- (A) Water (B) Super critical CO_2
(C) Ethylene glycol (D) Ionic liquids
76. Which of the followings is not a biodegradable polymer ?
- (A) Chitosan (B) Starch
(C) Hemicellulose (D) Bakelite

77. Non-stick utensils are made up from _____ polymer.

- (A) Perfluoroalkoxy alkane (B) Polytetrafluoroethylene
(C) Polyvinylidene fluoride (D) Ethylene tetrafluoroethylene

78. Which of the followings has highest conductivity ?

- (A) Acetylene (B) Cis-polyacetylene
(C) Trans-polyacetylene (D) Alkali metal doped polyacetylene

79. The water solubility of dyes can be increased by introducing :

- (A) SO_3Na groups (B) COOH groups
(C) OH groups (D) All of these

80. 2-ethyl 9-10-anthroquinol is oxidized in air to give :

- (A) Anthroquinone (B) Carbon dioxide
(C) Hydrogen peroxide (D) Anthracene



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