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

24-0010-F TEST BOOKLET

Time Allowed: 3:00 hrs | **MAIN PAPER- CHEMISTRY** | **Maximum Marks: 300**

INSTRUCTIONS TO CANDIDATES

***Read the instructions carefully before answering the questions*: -**

1. This Test Booklet consists of **12 (twelve) printed pages** and has **75 (seventy five) items (questions)**.
2. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET *DOES NOT* HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
3. **Please note that it is the candidate's responsibility to fill in the Roll Number and other required details carefully and without any omission or discrepancy at the appropriate places in the OMR Answer Sheet and the Separate Answer Booklet. Any omission/discrepancy will render the OMR Answer Sheet and the Separate Answer Booklet liable for rejection.**
4. Do not write anything else on the OMR Answer Sheet except the required information. Before you proceed to mark in the OMR Answer Sheet, please ensure that you have filled in the required particulars as per given instructions.
5. Use **only Black Ball Point Pen** to fill the OMR Answer Sheet.
6. This Test Booklet is divided into 4 (four) parts – **Part – I, Part - II , Part – III** and **Part IV.**
7. All FOUR parts are **Compulsory**.
8. **Part-I consists of Multiple Choice-based Questions.** The answers to these questions have to be marked in the **OMR Answer Sheet** provided to you.
9. **Part - II , Part – III** and **Part IV consist of Conventional Questions.** The answers to these questions have to be written in the **Separate Answer Booklet** provided to you.
10. In Part-I, each item (question) comprises of 04 (four) responses (answers). You are required to select the response which you want to mark on the OMR Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ***ONLY ONE*** response for each item.
11. After you have completed filling in all your responses on the OMR Answer Sheet and the Answer Booklet(s) and the examination has concluded, you should hand over to the Invigilator ***only the OMR Answer Sheet and the Answer Booklet(s)***. You are permitted to take the Test Booklet with you.
12. **Penalty for wrong answers in Multiple Choice-based Questions:**
    THERE WIL BE **PENALTY** FOR WRONG ANSWERS MARKED BY A CANDIDATE.
    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to the question will be deducted as penalty.
    (ii) If a candidate gives more than one answer, it will be treated as a **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to the question.
    (iii) If a question is left blank. i.e., no answer is given by the candidate, there will be **no penalty** for that question.

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PART – I
MULTIPLE CHOICE BASED QUESTIONS

Instructions for Questions 1 to 50:

- Choose the correct answer for the following questions
- Each question carries 3 marks (50 x 3 = 150 marks)

1. Which among following will show anisotropy?

   (a) Quartz glass
   (b) NaBr
   (c) Starch
   (d) Rubber

2. Which primitive unit cell has unequal edge length ($a \neq b \neq c$) and all axial angles are unequal and different from 90°C?

   (a) Hexagonal
   (b) Monoclinic
   (c) Tetragonal
   (d) Triclinic

3. In a solid AB having the NaCl Structure, "A" atoms occupy the corners of the cubic unit cell. If all the face centred atoms along one of the axes are removed, the resultant stoichiometry of the solid will be-

   (a) AB_2
   (b) A_2B
   (c) A_2B_3
   (d) A_3B_4

4. The ionic radii of Rb^+ and I^- are 1.46Å and 2.16 Å. The co-ordination number for the cation is

   (a) 2
   (b) 4
   (c) 6
   (d) 8

5. The gas with highest value of Henry's Constant for the solubility in water among the following is-

   (a) He
   (b) O_2
   (c) CH_4
   (d) CH_3CH_2Cl

6. Which of the following is dependent on temperature?

(a) Mole Fraction
(b) Molarity
(c) Molality
(d) Height percentage

7. The mixture which shows positive deviation from Raoult's law is-

(a) Ethanol + Acetone
(b) Chloroethane + Bromoethane
(c) Acetone + Chloroform
(d) Benzene + Toluene

8. The mole fraction of the solute in one molal aqueous solution is-

(a) 0.018
(b) 0.009
(c) 0.27
(d) 0.036

9. Which reaction is not feasible?

(a) $2KBr + I_2 \rightarrow 2KI + Br_2$
(b) $2KI + Br_2 \rightarrow 2KBr + I_2$
(c) $2H_2O + 2F_2 \rightarrow 4HF + O_2$
(d) $2KBr + Cl_2 \rightarrow 2KCl + Br_2$

10. The correct relationship between free energy and equilibrium Constant K of a reaction is-

(a) $\Delta Go = -RTlnK$
(b) $\Delta G = -RTlnK$
(c) $\Delta G = RTlnK$
(d) $\Delta Go = RTlnK$

11. If 0.01M solution of an electrolyte has a resistance of 40 Ω in a cell having a cell constant of 0.4 cm^{-1} then its Molar Conductance in ohm^{-1} cm^2 mol^{-1} is-

(a) 10
(b) 10_2
(c) 10_4
(d) 10_3

12. Which of the following is an insulator?

(a) Graphite
(b) Silicon
(c) Diamond
(d) Aluminium

13. The structure of XeO_3 is-

(a) Linear
(b) Pyramidal
(c) T-Shaped
(d) Planar

14. Which of the following statements is incorrect-

(a) B_2H_6 has sp^3 hybridisation
(b) BF_3 is lewis acid
(c) BH_4^- has triangular planar geometry
(d) NH_3 is lewis base

15. Which of the following is most stable?

(a) Al_+
(b) Tl_+
(c) In_+
(d) Ga_+

16. XeF_4 and XeF_6 are expected to be-

(a) Reducing
(b) Unreactive
(c) Oxidizing
(d) Strongly basic

17. Which of the following show maximum number of oxidation states?

(a) Fe
(b) Cr
(c) Mn
(d) V

18. Which of the following ions exhibits d-d transition and paramagnetism as well?

(a) MnO_{4-}
(b) Cr_2O_{7-}
(c) CrO_{4-2}
(d) MnO_{4-2}

19. The reason of Lanthanide Contraction is-

(a) Increasing nuclear charge
(b) Decreasing screening effect
(c) Decreasing nuclear charge.
(d) negligible screening effect of "f" orbital

20. Gadolinium has a low value of third ionisation enthalpy because of-

(a) High exchange enthalpy
(b) High electronegativity
(c) Small size
(d) High basic character

21. Which of the following statements is incorrect about SN^2 reaction

(a) SN^2 is second order reaction
(b) SN^2 is single step reaction
(c) In SN^2 carbocation intermediate is formed
(d) None of the above

22. Chlorobenzene gives biphenyl when reacted using sodium metal and dry ether. This is known as-

(a) Wurtz reaction
(b) Fittig reaction
(c) Wurtz-Fittig reaction
(d) Kolbe's electrolysis

23. The correct order of increasing bond length in the following alkyl halides is-
RI (I) RBr (II) RCl (III) RF (IV)

(a) I>II>III>IV
(b) IV>III>II>I
(c) I>III>II>IV
(d) IV>II>I>III

24. Which of the following gives haloform reaction?

(a) Benzaldehyde
(b) Acetic acid
(c) Acetone
(d) None of these

25. What is the name of the product which is obtained by the decarboxylation of sodium salt of salicylic acid with sodalime?

(a) Toluene
(b) Benzene
(c) Phenol
(d) Benzoic acid

26. Which one of the following alcohols gives most stable carbocation in acidic medium?

(a) Methanol
(b) Ethanol
(c) Propan-2-ol
(d) 2-Methylpropan-2-ol

27. When propene is reacted with diluted H_2SO_4 it gives-

(a) Propan-1-ol
(b) Propan-2-ol
(c) 2-Methylpropan-1-ol
(d) 2-Methylpropan-2-ol

28. Which of the following is most acidic from the following-

(a) 2-Nitrophenol
(b) 3-Nitrophenol
(c) Phenol
(d) 4-Nitrophenol

29. Which one of the following reactions does not give benzaldehyde as final product?

(a) Rosenmund reduction
(b) Etard reaction
(c) Gatterman-Koch
(d) Finkelstein reaction

30. Which reactant will not give aldol condensation in basic medium-

(a) Propanol
(b) Propanal
(c) Propanone
(d) None of these

31. If formaldehyde and KOH are heated, then we get-

(a) Methane
(b) Methyl alcohol
(c) Ethyl formate
(d) Acetylene

32. Which of the following compounds will give positive test with Tollen's reagent?

(a) Acetic acid
(b) Acetone
(c) Acetamide
(d) Acetaldehyde

33. Which one of the following on reduction with Lithium aluminium hydride yields a secondary amine?

(a) Methyl isocyanide
(b) Acetamide
(c) Methyl cyanide
(d) Nitroethane

34. Which of the following reactions is appropriate for converting acetamide to methanamine?

(a) Hoffmann hypobromamide reaction
(b) Gabriel pthalimide reaction
(c) Carbylamine reaction
(d) Stephen's reaction

35. Phenyl isocyanide is prepared by which of the following reactions?

(a) Reimer-Tiemann
(b) Carbylamine reaction
(c) Wurtz reaction
(d) Rosenmund reaction

36. Which of the following is more basic than aniline?

(a) Benzylamine
(b) Diphenylamine
(c) p-Nitroaniline
(d) Triphenylamine

37. Which of the following is the sweetest sugar?

(a) Lactose
(b) Serum
(c) Glucose
(d) Fructose.

38. On complete hydrolysis of starch, we finally get-

(a) Glucose
(b) Glucose and fructose
(c) Sucrose
(d) Fructose

39. Haemoglobin is a/an -

(a) Enzyme
(b) Vitamin
(c) Carbohydrate
(d) Globular protein

40. In DNA, the Complimentary bases are-

(a) Adenine and Guanine; thymine and cytosine
(b) Uracil and adenine; cytosine and guanine
(c) Adenine and thymine; Guanine and uracil
(d) Adenine and thymine; Guanine and cytosine

41. Which of the following statements is correct about Bakelite?

(a) It is a linear polymer
(b) It is an addition polymer
(c) It is a branched chain polymer
(d) It is cross linked polymer

42. Caprolactam is used for the manufacturing of-

(a) Terylene
(b) Teflon
(c) Nylon-6,6
(d) Nylon-6

43. The biodegradable polymer which can be produced from glycine and aminocaproic acid is-

(a) Nylon-2-Nylon-6
(b) PHBV
(c) Buna-N
(d) Nylon-6,6

44. Natural rubber is a polymer of -

(a) Styrene
(b) Isoprene
(c) Butadiene
(d) Ethyne

45. Which one of the following is employed as a tranquilizer drug?

(a) Promethazine
(b) Naproxen
(c) Mifepristone
(d) Valium

46. Aspirin is the acetylation product of-

(a) m-Hydroxy benzoic acid
(b) o-Dihydroxy benzene
(c) o-Hydroxy benzoic acid
(d) p-Dihydroxy benzene

47. Which of the following is a cationic detergent?

(a) Sodium stearate
(b) Cetyltrimethyl ammonium bromide
(c) Sodium dodecyl benzene sulphonate
(d) Sodium lauryl sulphate

48. The artificial sweetener stable at cooking temperature and does not provide calories is:

(a) Alitame
(b) Sucralose
(c) Saccharin
(d) Aspartame

49. When phenol is treated with chloroform and sodium hydroxide, the product formed is-

(a) Benzaldehyde
(b) Salicylaldehyde
(c) Salicylic acid
(d) Benzoic acid

50. Phosgene is the common name for?

(a) Thionyl chloride
(b) Phosphoryl chloride
(c) Carbonyl chloride
(d) Carbon dioxide and phosphine

PART – II

SHORT ANSWER TYPE QUESTIONS

(Answer any 10 out of 13 questions) 10 x 5 marks each = 50 marks

51. How will you distinguish F-center in imperfection of solids?

52. What do you understand by cryoscopic constant?

53. Calculate the equilibrium constant of the reaction:

$Cu\,(s) + 2Ag\,(aq.) \rightarrow Cu^{+2}\,(aq.) + 2\,Ag\,(s)$ Given $E^{o}_{cell} = 0.46$ V

54. What is the covalence of nitrogen in N_2O_5 and N_2O_4?

55. Give the difference between Lanthanide and Actinide Contraction?

56. Explain the leaving group ability in SN^2 reactions.

57. What happens if acetone reacts with methyl magnesium chloride?

58. How will you prepare Acetal and Ketal from carbonyl compounds?

59. Explain the Basic nature of amines in short.

60. Give the names of four vitamins which can be stored in our body?

61. What are thermosetting polymers? Give two examples.

62. Write a short note on food preservatives.

63. Can we prepare primary aromatic amine using Gabriel phthalimide synthesis?

PART- III

LONG ANSWER TYPE QUESTIONS

(Answer any 5 out of 8 questions) 5 x 10 marks each = 50 marks

64. Describe the packing efficiency of body-centered cubic cell and simple cubic cell?

65. Explain the vapour pressure of liquid-liquid solution using Raoult's Law.

66. Write explanatory notes on:

    (i) Interhalogen compounds

    (ii) Nature of oxides of d-block elements

67. (i) How do you explain the dipole moment of following compounds- CH_3F, CH_3Cl, CH_3Br and CH_3I

    (ii) Explain the reactivity of alkyl halides for SN' reaction.

68. (i) Why is the boiling point of p-nitrophenol greater than o-Nitrophenol? Explain.

    (ii) Explain the acidity of phenols using suitable examples.

69. (i) Explain why aldehydes are more reactive than ketones for Nucleophilic addition reaction.

    (ii) How do you convert benzene into aniline?

70. (i) How can you explain that glucose molecule has six carbon atoms linked in a straight chain

    (ii) Why is sucrose called invert sugar?

71. (i) Write notes on natural polymer, semisynthetic polymer and synthetic polymer.

    (ii) What problem arises in using alitame as artificial sweetener?

PART – IV

ESSAY TYPE QUESTIONS

(Answer any 2 out of 4 questions) 2 x 25 marks each = 50 marks

72. (i)What is electrochemical cell? Give the cell reaction for electrochemical cell and explain it with the help of Nernst Equation.

    (ii)Explain the Stoichiometric defects with the help of suitable examples.

73. Explain the following reactions with mechanism-

    i. Reimer Tiemann Reaction
    ii. Kolbe's Reaction
    iii. Gattermann Reaction
    iv. Haloform Reaction

74. Explain reduction of carboxy compounds with the help of Clemmensen reduction and Wolff-Kishner reduction.

75. Explain the following-

    (i) DNA Fingerprinting
    (ii) Synthetic detergents
    (iii) Structure of PCl_5

……x……..