CHEMICAL SCIENCES
Paper - II
OCT–10/03

Signature of Invigilators

1. .....

2. .....

Roll No. ☐☐☐☐☐
(In figures as in Admit Card)

Roll No. .....

.....
(in words)

Time Allowed : 75 Minutes] **[Maximum Marks : 100**

Instructions for the Candidates

1. Write your Roll Number in the space provided on the top of this page.
2. This paper consists of **fifty (50)** multiple choice type questions. **All** questions are compulsory.
3. Each item has upto four alternative responses marked (A), (B), (C) and (D). The answer should be a capital letter for the selected option. The answer letter should entirely be contained within the corresponding square.

   Correct method [A] Wrong method [A] OR [A]
4. Your responses to the items for this paper are to be indicated on the ICR Answer Sheet under Paper II only.
5. Read instructions given inside carefully.
6. Extra sheet is attached at the end of the booklet for rough work.
7. You should return the test booklet to the invigilator at the end of paper and should not carry any paper with you outside the examination hall.
8. There shall be no negative marking.
9. Use of calculator or any other electronic devices is prohibited.

પરીક્ષાર્થીઓ માટે સૂચનાઓ :

૧. આ પાનાની ટોચમાં દર્શાવેલી જગ્યામાં તમારો રોલનંબર લખો.

૨. આ પ્રશ્નપત્રમાં બહુવૈકલ્પિક ઉત્તરો ધરાવતા કુલ **પચાસ (૫૦)** પ્રશ્નો આપેલા છે. **બધા જ** પ્રશ્નો ફરજિયાત છે.

૩. પ્રત્યેક પ્રશ્ન વધુમાં વધુ ચાર બહુવૈકલ્પિક ઉત્તરો ધરાવે છે. જે (A), (B), (C) અને (D) વડે દર્શાવવામાં આવ્યા છે. પ્રશ્નનો ઉત્તર કેપીટલ સંજ્ઞા વડે આપવાનો રહેશે. ઉત્તરની સંજ્ઞા આપેલ ખાનામાં બરાબર સમાઈ જાય તે રીતે લખવાની રહેશે.

   ખરી રીત : [A] ખોટી રીત : [A] , [A]

૪. આ પ્રશ્નપત્રના જવાબ આપેલ ICR Answer Sheet ના Paper II વિભાગની નીચે આપેલ ખાનાઓમાં આપવાના રહેશે.

૫. અંદર આપેલ સૂચનાઓ કાળજીપૂર્વક વાંચો.

૬. આ બુકલેટની પાછળ આપેલું પાનું રફ કામ માટે છે.

૭. પરીક્ષા સમય પૂરો થઈ ગયા પછી આ બુકલેટ જે તે નિરીક્ષકને સોંપી દેવી. કોઈપણ કાગળ પરીક્ષા ખંડની બહાર લઈ જવો નહીં.

૮. ખોટા જવાબ માટે નેગેટિવ ગુણાંકન પ્રથા નથી.

૯. કેલ્કયુલેટર અને ઈલેક્ટ્રોનિક યંત્રોનો પ્રયોગ કરવાની મનાઈ છે.

SEAL

CHEMICAL SCIENCES

PAPER-II

Note : This paper contains **FIFTY (50)** multiple-choice questions, each question carrying **TWO (2)** marks. Attempt **All** the questions.

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1. The bonds present in $K_4[Fe(CN)_6]$ are :

   (A) all ionic

   (B) all covalent

   (C) ionic, covalent and coordinate

   (D) ionic and covalent

2. An interstitial hole is called tetrahedral because :

   (A) It is formed by four spheres.

   (B) It is tetrahedral in shape.

   (C) It is formed by four spheres, the centres of which form a regular tetrahedron.

   (D) It is formed by four spheres, the centres of which form a square plane.

3. The point group assigned to acetic acid is :

   (A) C_1 (B) C_s

   (C) C_i (D) C_2

4. Which of the following has highest bond order ?

   (A) O_2 (B) O_2^+

   (C) O_2^- (D) O_2^{2-}

5. Which of the following elements will have lowest first ionisation energy ?

(A) Magnesium (B) Rubidium

(C) Lithium (D) Calcium

6. KCl dissolves in water because :

(A) It is a salt of potassium.

(B) It is an electrovalent compound.

(C) It reacts with water.

(D) Its ions are easily solvated.

7. The complex used as an anti-cancer drug is :

(A) cis-$[Pt(NH_3)_2\ Cl_2]$ (B) trans-$[Pt(NH_3)_2\ Cl_2]$

(C) $[Rh(NH_3)_6]^{3+}$ (D) $[Co(NH_3)_6]^{3+}$

8. The number of bridging carbonyls in $Fe_2(CO)_9$ is :

(A) three (B) one

(C) five (D) six

9. The structure of XeF_2 is :

(A) Linear with three lone pairs of electrons

(B) Bent with three lone pairs of electrons

(C) Square planar with two lone pairs of electrons

(D) Linear with two lone pairs of electrons

10. The oxidation state of Uranium in $2UO_2^{2+}$ is :

(A) +4 (B) +6

(C) +2 (D) +3

11. The zinc group elements (Zn, Cd, Hg) are called :

(A) Noble metals (B) Coinage metals

(C) Volatile metals (D) Precious metals

12. Which of the following halogens is a solid at room temperature ?

(A) Fluorine (B) Chlorine

(C) Bromine (D) Iodine

13. In the hydrogen spectrum, the Paschen series corresponds to electronic transition from :

(A) higher levels to first level

(B) higher levels to second level

(C) higher levels to third level

(D) higher levels to fourth level

14. For the following molecules, dipole moment in the increasing order is :

(A) $H_2S < NH_3 < H_2O < HF$

(B) $HF < H_2O < NH_3 < H_2S$

(C) $H_2S < HF < H_2O < NH_3$

(D) $NH_3 < HF < H_2S < H_2O$

15. The electronic configuration of four elements A, B, C, D are as follows, which will be the most metallic ?

(A) 2, 8, 4 (B) 2, 8, 8

(C) 2, 8, 8, 1 (D) 2, 8, 8, 7

16. Which of the following is most effective in causing coagulation of ferric hydroxide sol. ?

(A) Na_3PO_4 (B) $AlCl_3$

(C) Na_2SO_4 (D) $K_4[Fe(CN)_6]$

17. Which one is *correctly* matched ?

(A) Emulsion — curd (B) Foam — mist

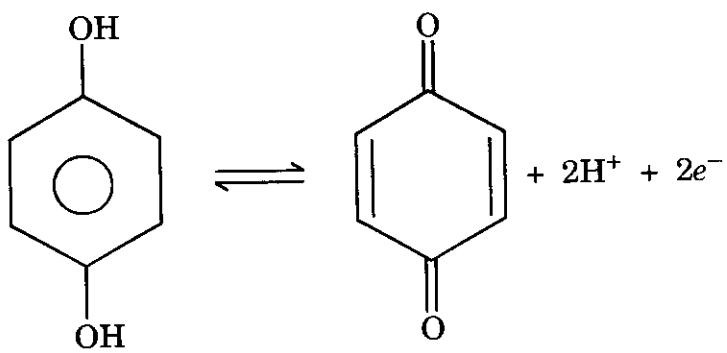
(C) Aerosol — smoke (D) Solid sol — cake

18. The relation between principal moments of inertia for a symmetric top molecule is :

(A) $I_A = I_B = I_C$ (B) $I_A \neq I_B \neq I_C$

(C) $I_B = I_C \neq I_A$, $I_A = 0$ (D) $I_B = I_C \neq I_A$, $I_A \neq 0$

19. At pH = 2.0 if $E^{\circ}_{quinhydrone} = 1.30$ V



then $E_{quinhydrone}$ will be :

(A) 1.36 V (B) 1.30 V

(C) 1.42 V (D) 1.20 V

20. To produce 160 g of oxygen the number of moles of water required to be electrolysed is :

(A) 2.5 (B) 5.0

(C) 10.0 (D) 20.0

21. Which of the following properties will *not* decrease with increase in temperature ?

(A) Surface tension (B) Viscosity

(C) Density (D) Vapour pressure

22. The maximum number of phases that can remain in equilibrium for a one component system is :

(A) 1 (B) 2

(C) 3 (D) 4

23. For the following particles having same kinetic energy which would have the maximum de Broglie wavelength ?

(A) α-particle (B) β-particle

(C) proton (D) neutron

24. The freezing point of equimolar aqueous solutions will be highest for :

(A) $C_6H_5NH_3 . Cl$ (anilinium chloride)

(B) $Ca(NO_3)_2$

(C) $La(NO_3)_2$

(D) $C_6H_{12}O_6$ (glucose)

25. At what angle (in radians) first order diffraction occurs if the spacing between two planes in $\lambda/2$?

(A) $\pi/6$ (B) 0

(C) $3\pi/2$ (D) $\pi/2$

26. The conjugate acid of NH_2^- is :

(A) NH_3 (B) NH_4^+

(C) N_2H_4 (D) NH_2OH

27. For a first order reaction, the time taken to reduce initial concentration of reactant by a factor of $\frac{1}{4}$ is 10 min. The time required to reduce initial concentration by a factor of $\frac{1}{16}$ will be :

(A) 100 min (B) 20 min

(C) 30 min (D) 40 min

28. Number of radial and angular nodes exhibited by $3d_z^2$ hydrogenic orbital are respectively :

(A) 0, 2 (B) 0, 0

(C) 2, 2 (D) 2, 0

29. The number of fundamental modes of vibration of OCS molecule is equal to :

(A) 3 (B) 4

(C) 2 (D) 9

30. For a spontaneous process :

(A) $\Delta S = 0$ (B) $\Delta S < \frac{q}{T}$

(C) $\Delta S > \frac{q}{T}$ (D) $\Delta S = \frac{q}{T}$

31. Bromine reacts with fumaric acid to give :

(A) (*d*)-2, 3-dibromo succinic acid

(B) (*l*)-2, 3-dibromo succinic acid

(C) (*dl*)-dibromo succinic acid

(D) meso dibromo succinic acid

32. Conversion of alcohol in the presence of thionyl chloride into alkyl halide is an example of :

(A) S_N^1 (B) S_N^2

(C) S_N^i (D) S_NAr

33. The reaction that can be affected by sodium in dry ether is known as :

(A) Cannizaro reaction

(B) Acyloin condensation

(C) Birch reduction

(D) Meerwein-Ponderf Verley reaction

34. When Salicylic acid is treated with *excess* of bromine, the product formed is :

(A) 2, 4, 6-tribromophenol

(B) 2, 4, 6-tribromobenzoic acid

(C) 2, 4-dibromo-6-hydroxy benzoic acid

(D) 2, 5-dibromo-6-hydroxy benzoic acid

35. Arrange the compounds Ph—CH_2—Ph, $CH_3CH_2CH_3$ and CH_4 in the decreasing order of acidity :

(A) $Ph_2CH_2 > CH_3CH_2CH_3 > CH_4$

(B) $Ph_2CH_2 > CH_4 > CH_3CH_2CH_3$

(C) $CH_3CH_2CH_3 > CH_4 > Ph_2CH_2$

(D) $CH_4 > CH_3CH_2CH_3 > Ph_2CH_2$

36. The decreasing order of stability of the carbocation is :

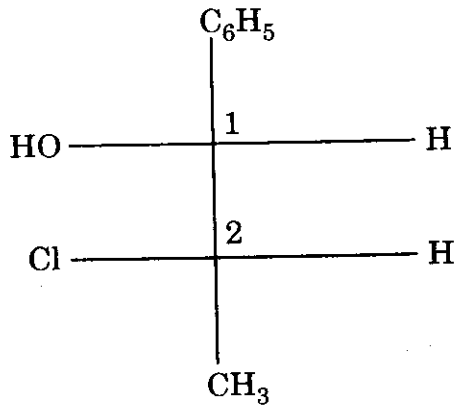
$CH_3-\overset{+}{C}H_2-CH=CH_2$ (I)

$(CH_3)_2CH^+$ (II)

$(CH_3)_2-\underset{+}{C}H-CH=CH_2$ (III)

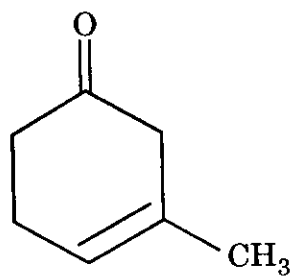
(A) I > II > III (B) II > I > III
(C) III > I > II (D) III > II > I

37. The absolute configuration of the asymmetric centres in the given molecule is :



(A) 1R, 2S (B) 1S, 2R
(C) 1R, 2R (D) 1S, 2S

38. IUPAC nomenclature of the following compound is :



(A) 5-methyl-cyclohex-4-en-1-one
(B) 3-methyl-cyclohex-3-en-1-one
(C) 1-methyl-cyclohex-1-en-5-one
(D) 2-methyl-cyclohex-1-en-4-one

39. Which of the following alkyl halide give in ^{1}HNMR one doublet and one septet ?

(A) $CH_3\ CH_2\ CH_2\ Br$ (B) $CH_3\ CH_2\ CH_2\ CH_2\ Br$

(C) $CH_3\ CH\ Br\ CH_2\ Br$ (D) $(CH_3)_2\ CH\ .\ Br$

40. Which is the IR absorption band for the functional group $-C \equiv N$?

(A) 3200-3600 cm^{-1} (B) 2250 cm^{-1}

(C) 1710 cm^{-1} (D) 1350 and 1550 cm^{-1}

41. The smallest possible cyclic system possessing aromaticity is :

(A) Cyclopentadienyl anion (B) Benzene

(C) Cyclopropenyl cation (D) Tropylium cation

42. When a conjugated double bond is appended in organic compound, the absorption band shifts to a higher wavelength (λ). This is referred to as :

(A) Auxochromic shift (B) Bathochromic shift

(C) Hypsochromic shift (D) Chromophoric shift

43. The conversion of α-pinene to isobornyl chloride in presence of hydrochloric acid is known as :

(A) Diels Alder reaction

(B) Somelett rearrangement

(C) Wagner-Meerwein rearrangement

(D) Patterno-Buchi reaction

44. Claisen rearrangement is :

(A) 4 + 2 addition (B) [1, 3] sigmatropic

(C) [3, 3] sigmatropic (D) [1, 5] sigmatropic

45. Glucose and Fructose both on treatment with phenyl hydrazine can give identical osazone. Both glucose and fructose have :

(A) same configuration at C_1 and C_2

(B) different configuration at C_3 and C_6

(C) different configuration at C_1 and C_2

(D) different configuration at C_1 alone

46. The number of significant figures in the number 0.0670 is :

(A) 1 (B) 2

(C) 3 (D) 4

47. Paracetomol, the commonly used drug is a/an :

(A) antipyretic (B) antimalarial

(C) antidepressant (D) antibacterial

48. Ionic product of water at 90°C is :

(A) equal to 10^{-14} (B) less than 10^{-14}

(C) greater than 10^{-14} (D) equal to 10^{-7}

49. If T is the transmittance, then absorbance A is equal to :

(A) log T (B) $\log \frac{1}{T}$

(C) log (%T) (D) $\frac{1}{T}$

50. The separation of complicated mixtures of macromolecules can be achieved by :

(A) SDS-PAGE

(B) Isoelectric focusing

(C) Two-dimensional electrophoresis

(D) MALDI-TOF

ROUGH WORK