OCET 2011

Sr. No. : [　　　　]

Question Booklet Series : A

Important : Please consult your Admit Card / Roll No. Slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.   *In Figures*   *In Words*

[　][　][　][　][　][　]

O.M.R. Answer Sheet Serial No.   [　][　][　][　][　]

Signature of the Candidate : _____

Subject : M. Sc. (Hons. School/2 Year Course)-Chemistry

Time : 90 minutes   **Number of Questions : 75**   **Maximum Marks : 75**

DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO

INSTRUCTIONS

1. Write your Roll No. on the Question Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Subject and Series Code of Question Booklet on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Ball Point / Black Gel pen.**
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. To open the Question Booklet remove the paper seal (s) gently when asked to do so.
5. Please check that this Question Booklet contains **75** questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of test.
6. Each question has four alternative answers (A, B, C, D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Ball Point / Black Gel pen.**
7. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Sheet. No marks will be deducted in such cases.
8. Darken the bubbles in the OMR Answer Sheet according to the Serial No. of the questions given in the Question Booklet.
9. Negative marking will be adopted for evaluation i.e., 1/4th of the marks of the question will be deducted for each wrong answer. A wrong answer means incorrect answer or wrong filling of bubble.
10. For calculations, use of simple log tables is permitted. Borrowing of log tables and any other material is not allowed.
11. For rough work only the sheets marked "Rough Work" at the end of the Question Booklet be used.
12. The Answer Sheet is designed for **computer evaluation**. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e., not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/ noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistance or found giving or receiving assistance or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent / Observer whose decision shall be final.
16. **Telecommunication equipment such as pager, cellular phone, wireless, scanner, etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
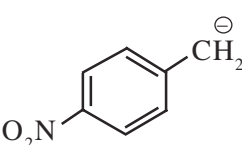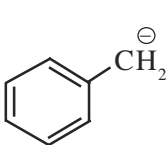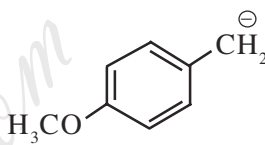
1. **The reactive intermediate carbene can be trapped by reaction with :**
   - (A) Electrophile
   - (B) Free radical
   - (C) Alkene
   - (D) Nucleophile

2. **The first step in photochemical chlorination of methane is :**
   - (A) Homolytic cleavage of chlorine molecule
   - (B) Formation of carbanion
   - (C) Homolytic cleavage of methane
   - (D) Hetrolytic cleavage of chlorine

3. **The decreasing order of stability in the following set of carbanion is :**

   I. O_2N — (benzyl anion with $\overset{\ominus}{CH_2}$)   II. (benzyl anion with $\overset{\ominus}{CH_2}$)   III. H_3CO — (benzyl anion with $\overset{\ominus}{CH_2}$)

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

4. **Assign R / S configuration to the following compound :**

   ```
         COOH
   H ——|—— OH
   H ——|—— OH
         COOH
   ```
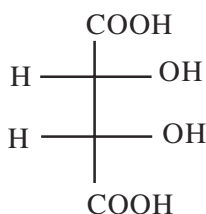
   - (A) 2S, 3R
   - (B) 2R, 3R
   - (C) 2S, 3S
   - (D) 2R, 3S

5. **The number of configurational isomer in 2, 3-dibromo cinnamic acid is :**
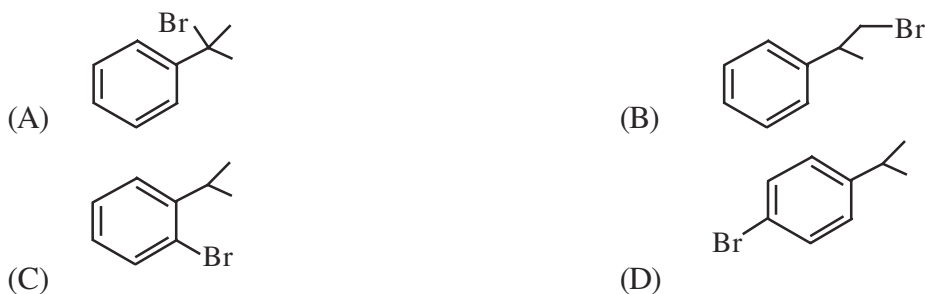   - (A) 3
   - (B) 4
   - (C) 2
   - (D) 1

6. **The conversion of 1-butene to 1-butanol can be achieved by :**
   - (A) H_2O, H_2SO_4
   - (B) B_2H_6, H_2O_2 / OH^-
   - (C) $Hg(OAc)_2$ / $NaBH_4$
   - (D) HBr / KOH

7. **Which of the following alkene gives acetaldehyde and 3-pentanone upon ozonolysis ?**
   - (A) 3-Ethyl-2-pentene
   - (B) 3-Ethyl-1-pentene
   - (C) 2-Ethyl-2-pentene
   - (D) 1-Ethyl-1-pentene

8. **Free radical bromination of isopropyl benzene gives :**

(A)

(B)

(C)

(D)

9. **Aryl halides are less reactive as compared to alkyl halides toward nucleophilic substitution due to :**

(A) Inducitive effect

(B) Mesomeric effect

(C) Field effect

(D) Resonance stabilisation

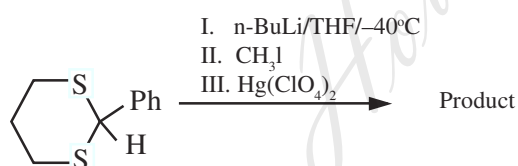10. **Which of the compound react fastest with conc. HBr ?**

(A) n-Propyl alcohol

(B) iso-Propyl alcohol

(C) 2-Methyl-1-propanol

(D) 2-Methyl-2-propanol

11. **The reagent X and Y for the transformations given below are :**
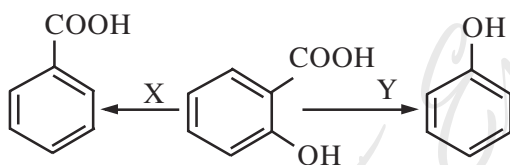
(A) HI & NaOH

(B) Sn / HCl & NaHCO$_3$

(C) Zn / AcOH & H$_2$ / Pd-C

(D) Zn dust and Soda lime

12. **The major product in the reaction given below is :**

I. n-BuLi/THF/–40ºC
II. CH$_3$l
III. Hg(ClO$_4$)$_2$

Product

(A) Benzaldehyde

(B) Acetophenone

(C) Benzoic acid

(D) Benzylalcohol

13. **Reduction of carbonyl group to methylene i.e. (C = O → CH$_2$) can be achieved by :**

(A) Wolf-Kishner reduction

(B) MPV reduction

(C) NaBH$_4$ reduction

(D) Rousenmund reduction

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14. The correct order of decreasing acidity following carboxylic acid is :

I.

II.

III.

IV.
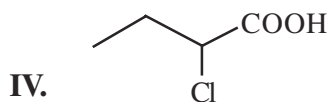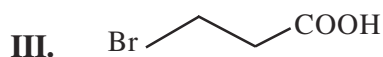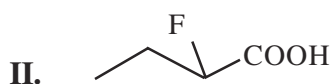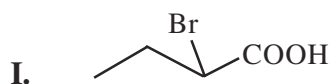
(A) I > III > II > IV

(B) II > IV > I > III

(C) I > IV > II > III

(D) III > IV > II > I

15. Acetic anhydride can be prepared by reaction of :

(A) Acetic acid with sodium acetate

(B) Acetic acid with aluminum chloride

(C) Acetic acid with phosphorus pentaoxide

(D) Acetic acid with ihionyl chloride

16. Separation of primary, secondary and tertiary amines can be achieved by :

(A) Hinsberg's reagent

(B) Sanger's reagent

(C) Brady's reagent

(D) Tollen's reagent

17. Reduction of benzonitrile (C_6H_5CN) with lithium aluminium hydride gives :

(A) Aniline

(B) Benzyl amine

(C) o-Toludine

(D) Benzamide

18. The pH at which amino acid behaves as neutral molecule is known as :

(A) Equivalent point

(B) Isoelectric point

(C) Neutralization equivalent

(D) Iodine number

19. Which of the following carbohydrate is not a reducing sugar ?

(A) Glucose

(B) Maltose

(C) Sucrose

(D) Fructose

20. Which of the following atom do not exhibit nuclear magnetic resonance ?

(A) N^{14}

(B) C^{13}

(C) P^{31}

(D) F^{19}

21. The region below 1500 cm^{-1} in infrared spectroscopy is known as :

(A) Far infrared region

(B) Near infrared region

(C) Finger print region

(D) Microwave region

22. The acidity of methylene protons in ethyl acetoacetate is due to :
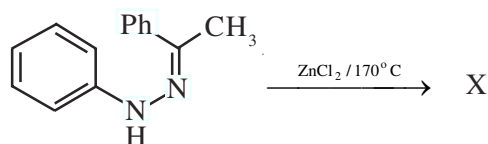
(A) Inductive effect

(B) Field effect

(C) Mesomeric effect

(D) Resonance stabilisation

23. **Pyridine is less basic as compared to triethyl amine because lone pair resides in :**

    (A) sp hybride orbital   (B) sp^3 hybride orbital

    (C) sp^2 hybride orbital   (D) p-orbital

24. **The product X in the following reaction is :**

$$\xrightarrow{ZnCl_2 / 170^{\circ}C} \quad X$$

    (A) 2-Methyl indole   (B) 2-Phenyl indole

    (C) 1-Phenyl-2-methyl indole   (D) 1-methyl-2-phenyl indole

25. **Reaction of methyl magnesium bromide (3 eq.) with diethyl carbonate followed by acidic hydrolysis gives :**

    (A) 2-Methyl-2-propanol   (B) 2-Propanol

    (C) 1-Propanol   (D) Propanal

26. **The structure of beryllium chloride in the solid state is :**

    (A) Bridged dimer   (B) Polymeric chain structure

    (C) Linear   (D) Tetrahedral

27. **The element with atomic number 35 in the periodic table belongs to :**

    (A) *s*-block   (B) *p*-block

    (C) *d*-block   (D) *f*–block

28. **The geometry of $XeOF_2$:**

    (A) Pyramidal   (B) Octahedral

    (C) T-shaped   (D) Tetrahedral

29. **Alkyl lithium reacts with carbon dioxide to give :**

    (A) Carboxylic acid   (B) Alcohol

    (C) Ketone   (D) Esters

30. **Which of the following ion has highest enthalpy of hydration ?**

    (A) Li^+ (B) Na^+

    (C) Rb^+ (D) Cs^+

31. **The bond order in superoxide $(O_2)^-$ ion is :**

    (A) 2   (B) 2.5

    (C) 1.5   (D) 3

32. **The oxidation state of nitrogen in ammonium nitrate corresponds to :**
    (A) +3
    (B) +5
    (C) +3 and +5
    (D) −3 and +5

33. **In Wurtzite structure, Zn^{2+} ions occupy :**
    (A) All tetrahedral sites
    (B) Half tetrahedral sites
    (C) All octahedral sites
    (D) Half octahedral sites

34. **The state of hybridisation in interhalogen ion, ICl_4^- is :**
    (A) sp^3 hybridisation
    (B) sp^3d hybridisation
    (C) sp^3d^2 hybridisation
    (D) sp^3d^3 hybridisation

35. **In the first transition series, the highest oxidation state is shown by :**
    (A) Cr
    (B) Co
    (C) Cu
    (D) Mn

36. **Ruthenium and osmium in the periodic table belong to :**
    (A) Cu
    (B) Mn
    (C) Fe
    (D) Cr

37. **Which of the following has lowest oxidation state of the central atom ?**
    (A) $Fe_3[Fe(CN)_6]$
    (B) $Na[Co(CO)_4]$
    (C) $Fe(CO)_5$
    (D) $[Co(en)_3]Cl_3$

38. **The coordination number of cerium in $[Ce(NO_3)_4(Ph_3PO)_2]^{2-}$ is :**
    (A) 4
    (B) 6
    (C) 8
    (D) 10

39. **Which of the following statements is not correct for actinides and lanthanides ?**
    (A) Oxidation state of +3 is predominant in both the cases
    (B) Both show contraction in their ionic radii
    (C) The elements of both the series are radioactive
    (D) Both involve the filling of f-orbitals

40. **Cu^+ disproportionates into :**
    (A) Cu only
    (B) Cu^{2+} and Cu^{3+}
    (C) Cu^{2+} and Cu
    (D) Cu and Cu^-

41. **Which of the following is the strongest acid ?**
    (A) $HClO_4$
    (B) $HClO_3$
    (C) $HClO_2$
    (D) HOCl

42. **AgCl is soluble in ammonium hydroxide due to the formation of :**
    (A) $AgNH_2$
    (B) $AgCl.NH_3$
    (C) $[Ag(NH_3)_2Cl]$
    (D) $NH_4[AgCl_2]$

43. **The highest crystal field splitting will be for the ligand :**

(A) $C_2O_4^{2-}$

(B) NO_2^-

(C) NH_3

(D) CN^-

44. **Heme is a porphyrin complex of :**

(A) Fe(II)

(B) Fe(III)

(C) Mg(II)

(D) Zn(II)

45. **Ground state term of d^5 configuration is :**

(A) ^6S

(B) ^4F

(C) ^2D

(D) ^3P

46. **Which of the following does not have bridging carbonyls ?**

(A) $Fe_3(CO)_{12}$

(B) $Fe_2(CO)_9$

(C) $Co_4(CO)_{12}$

(D) $Ru_3(CO)_{12}$

47. **Which of the following is not an organometallic compound ?**

(A) $Pb(C_2H_5)_4$

(B) $Fe(C_5H_5)_2$

(C) $Si(OC_2H_5)_4$

(D) $Sn(C_4H_9)_4$

48. **Which of the given complex does not give precipitate of silver chloride on addition of silver nitrate ?**

(A) $CoCl_3.6NH_3$

(B) $CoCl_3.5NH_3$

(C) $CoCl_3.4NH_3$

(D) $CoCl_3.3NH_3$

49. **Which of the following is not a hard acid ?**

(A) Na^+

(B) Mg^{2+}

(C) Ti^{4+}

(D) Hg^{2+}

50. **The colour of copper sulphide is :**

(A) Red

(B) Yellow

(C) Black

(D) Blue

51. **What will be the energy (in eV) of an electron in ground state constrained to move in an infinite one dimensional box of width 1Å ?**

(A) 38 eV

(B) 152 eV

(C) 19 eV

(D) 342 eV

52. **The Hook's law potential of an Simple Harmonic Oscillator is :**

(A) A circle

(B) An ellipse

(C) A parabola

(D) A hyperbola

53. **The equation for the Lambert's law is :**

(A) $\ln(I_0/I) = -bx$

(B) $\ln(I/I_0) = -bx$

(C) $\ln(I/I_0) = -\epsilon Cx$

(D) $\ln(I/I_0) = \epsilon Cx$

54. Which of the following molecule is IR-inactive but Raman-active ?

(A) Protein

(B) HBr

(C) H_2O

(D) N_2

55. A compound of Xe and F is found to have 53.5% of Xe. What is the oxidation state of Xe in this compound ?

(A) –4

(B) 0

(C) +4

(D) +6

56. Amount of heat required to change 1g ice at $0^{\circ}C$ to 1g steam at 100° C is :

(A) 616 cal

(B) 12 kcal

(C) 717 cal

(D) 919 cal

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

(A) $S_T = C_P/2$

(B) $S_T = C_P/3$

(C) $S_T = C_P/4$

(D) $S_T = C_P$

58. Calculate the enthalpy of hydration of anhydrous copper sulphate $(CuSO_4)$ into hydrated copper sulphate $(CuSO_4.5H_2O)$. Given that the enthalpies of solutions of anhydrous copper sulphate and hydrated copper sulphate are –66.5 and +11.7 kJ/mol respectively.

(A) –78.2 kJ/mol

(B) –54.8 kJ/mol

(C) +54.8 kJ/mol

(D) +78.2 kJ/mol

59. The electronic partition function of an atom whose atomic state is $^2D_{3/2}$ is :

(A) 3/2

(B) 3

(C) 4

(D) 2/3

60. The distance travelled by an ion per second under a potential gradient of 1 volt per cm is called :

(A) Ionic gradient

(B) Ionic mobility

(C) Ionic potential

(D) Ionic conductance

61. The pH of a solution is enhanced from 2 to 3. The concentration of H^+ in the new solution

(A) is three times the original solution

(B) is about 1.5 times the original solution

(C) Increases 10 times

(D) Decreases 10 times

62. The standard reduction potentials in volts for Pb^{2+} and Ag^+ are –0.13 and +0.80 respectively. Calculate E^o in volts for a cell in which the overall reaction is $Pb + 2\,Ag^+ \rightarrow Pb^{2+} + 2\,Ag$:

(A) 0.93

(B) 0.67

(C) 1.73

(D) 1.47

63. A crystal having unit cell dimensions $a \neq b \neq c$, $\alpha = \beta = \gamma = 90^{\circ}$ is :

(A) Cubic

(B) Tetragonal

(C) Monoclinic

(D) Orthorhombic

64. **The edge length of face centered unit cubic cell is 508 pm. If the radius of the cation is 110 pm, radius of the anion is :**

(A) 144 pm

(B) 288 pm

(C) 618 pm

(D) 398 pm

65. **The value of van der Waal's constant 'a' for hydrogen gas when critical temperature is 33.2°C and its critical pressure is 12.4 atm :**

(A) 24.912 atm litre^2 mol^{-1}

(B) 21.439 atm litre^2 mol^{-1}

(C) 47.935 atm litre^2 mol^{-1}

(D) 37.428 atm litre^2 mol^{-1}

66. **A gas will approach ideal behaviour at :**

(A) Low temp and low pressure

(B) Low temp and high pressure

(C) High temp and low pressure

(D) High temp and high pressure

67. **Which of the following pairs of solutions will be isotonic at the same temperature ?**

(A) 0.1 m glucose and 0.1 m KCl

(B) 0.1 m glucose and 0.1 m $MgCl_2$

(C) 0.1 m K_2SO_4 and 0.1 m KCl

(D) 0.1 m Na_2SO_4 and 0.1 m $Ca(NO_3)$

68. **The units in which surface tension is measured :**

(A) Dyne cm

(B) Dyne cm^{-1}

(C) Dyne^{-1} cm

(D) Dyne^{-1} cm^{-1}

69. **The half life period for catalytic decomposition of AB_3 at 50 mm is 4 hrs and at 100 mm it is 2 hrs. The order of the reaction is :**

(A) Zero

(B) 1

(C) 2

(D) 3

70. **The modified distribution law for the solute undergoing dissociation in one of the solvents is :**

(A) $K_D = C_1 / \sqrt{C_2}$

(B) $K_D = C_1 / C_2 (1 - \alpha)$

(C) $K_D = C_1 / C_2 (\alpha - 1)$

(D) $K_D = C_1 / C_2$

71. **The decomposition of $CaCO_3$ in a closed vessel is represented by the equation**

$$CaCO_3 (s) \leftrightarrow CaO (s) + CO_2 (g)$$

The number of phases and components respectively are :

(A) 3 and 2

(B) 2 and 3

(C) 2 and 2

(D) 3 and 3

72. **The activation energy of a reaction can be determined from the slope of which of the following graphs :**

(A) ln k vs T

(B) ln k / T vs 1/T

(C) T / ln k vs 1/T

(D) ln k vs 1/T

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73. **The function of alum used for the purification of water is to :**

    (A)   Coagulate the sol particles   (B)   Disperse the sol particles

    (C)   Emulsify the sol particles   (D)   Absorb the sol particles

74. **Freundlich isotherms is not applicable at :**

    (A)   Room temperature   (B)   Low pressure

    (C)   273 K   (D)   High pressure

75. **The osmotic pressure in millimetres of mercury at 15ºC of a solution of naphthalene ($C_{10}H_8$) in benzene containing 14g of naphthalene per litre of solution :**

    (A)   2.586 mm   (B)   1965 mm

    (C)   262 mm   (D)   199037 mm

ROUGH WORK