

M.Sc. Chemistry

12P/206/29

Question Booklet No... 3932

(To be filled up by the candidate by blue/black ball-point pen)

Roll No.

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Roll No.

(Write the digits in words)

Serial No. of OMR Answer Sheet

Day and Date

(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES

(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope*.
3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*
4. Write your *Roll Number and Serial Number of the Answer Sheet by pen* in the space provided above.
5. **On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.**
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and also Roll No. and OMR Sheet No. on the Question Booklet.
7. Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.
8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the Answer Sheet.*
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed.* If you *do not wish to attempt* a question, leave all the circles in the corresponding row blank (such question will be awarded zero mark).
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit *only the OMR Answer Sheet* at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

No. of Questions/प्रश्नों की संख्या : 150

Time/समय : 2½ Hours/घण्टे

Full Marks/पूर्णांक : 450

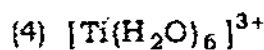
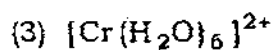
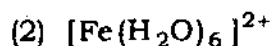
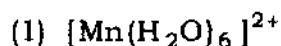
Note/नोट : (1) Attempt as many questions as you can. Each question carries 3 marks. One mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न 3 अंक का है। प्रत्येक गलत उत्तर के लिए एक अंक काटा जाएगा। प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक शून्य होगा।

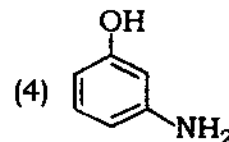
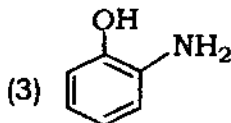
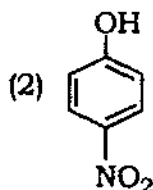
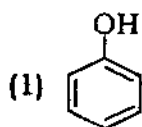
(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

1. Example of d^6 complex is



2. Acidic strength is greater in



3. Cannizzaro reaction is not given by
- (1) formaldehyde (2) acetaldehyde
 (3) benzaldehyde (4) trimethylacetaldehyde
4. The equilibrium constant of a reaction $A + B \rightleftharpoons C + D$ at 327°C is 1×10^{-12} and at 527°C is 1×10^{-7} . The enthalpy of reaction is
- (1) $+54.84$ kcal/mole (2) -54.84 kcal/mole
 (3) 548.4 kcal/mole (4) 5.84 kcal/mole
5. The wave mechanical model of atom depends on
- (1) de Broglie equation (2) Heisenberg uncertainty principle
 (3) Schrödinger wave equation (4) All of the above
6. In the cell $\text{Zn} | \text{ZnSO}_4 (1.0 \text{ M}) || \text{Fe}^{2+} (1.0 \text{ M}), \text{Fe}^{3+} (1.0 \text{ M}) | \text{Pt}$, given that $\text{Fe}^{3+} / \text{Fe}^{2+}$, $\text{Pt} = 0.769 \text{ V}$ and $\text{Zn}^{2+} / \text{Zn} = -0.76 \text{ V}$, the standard e.m.f. of the cell is
- (1) 0.76 V (2) -1.529 V (3) -0.769 V (4) 1.529 V
7. Ground term symbol for Mn^{2+} (25) is
- (1) 3F_2 (2) ${}^2D_{3/2}$ (3) ${}^6S_{5/2}$ (4) 5D_4
8. Benzene reacts with methyl chloride in presence of anhydrous AlCl_3 to give toluene. This reaction is called
- (1) alkylation of benzene (2) Friedel-Crafts reaction
 (3) methylation reaction (4) All of the above

13. Density of 2.05 M solution of acetic acid in water is 1.02 g/ml. The molality of solution is

- (1) 3.28 mol/kg (2) 2.28 mol/kg (3) 3.24 mol/kg (4) 1.14 mol/kg

14. In a cubic crystal total elements of symmetry are

- (1) 9 (2) 13 (3) 1 (4) 23

15. Lattice energy of solids increases if

- (1) the radii of ions are small (2) the ions are neutral
(3) charges on the ions are small (4) Madelung's constant decreases

16. If the value of radius ratio $\left(\frac{r^+}{r^-}\right)$ is 0.213, then coordination number of cation is

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

17. Quantized rotational energy of molecule is given as

- (1) $v(r) = D_e [1 - \exp(-\beta(r - r_e))]^2$ (2) $\mu_S = -g \times e / 2m_e c \times \frac{h}{2\pi} \sqrt{S(S+1)}$
(3) $\epsilon_J = J(J+1) h^2 / 8\pi^2 I$ (4) $\nu = \frac{\Delta E}{h} = \frac{\epsilon_{\text{upper}} - \epsilon_{\text{lower}}}{h}$

18. The observed chemical shift of a proton is 300 Hz from TMS and operative frequency of the spectrometer is 100 MHz. The chemical shift in term of δ (ppm) is

- (1) 1.5 (2) 4.5 (3) 3.0 (4) 6.0

19. The wave function (ψ) for hydrogen atom in terms of polar coordinates, is given by $\psi(r, \theta, \phi) = R(r)\Theta(\theta)\Phi(\phi)$. Which of the functions determines the shape of atomic orbitals?

- (1) $R(r)$ (2) $\Theta(\theta)$ (3) $\Phi(\phi)$ (4) None of these

20. The energy can be represented in terms of partition functions by the following equation

$$(1) E = kT \left(\frac{\partial \ln \theta}{\partial T} \right)_V$$

$$(2) E = kT^2 \left(\frac{\partial \ln \theta}{\partial T} \right)_V$$

$$(3) E = \frac{k}{T} \left(\frac{\partial \ln \theta}{\partial T} \right)_V$$

$$(4) E = \frac{k}{T^2} \left(\frac{\partial \ln \theta}{\partial T} \right)_V$$

21. According to Bose-Einstein statistics the probability distribution is given by

$$(1) \frac{n_i}{g} = \frac{1}{e^{\alpha + \beta \epsilon_i}}$$

$$(2) \frac{n_i}{g} = \frac{1}{e^{\alpha + \beta \epsilon_i} - 1}$$

$$(3) \frac{n_i}{g} = \frac{1}{e^{\alpha + \beta \epsilon_i} + 1}$$

(4) None of these

22. The half-life of radium is 1600 years. After how much time will 1 gm radium reduce to 125 mg?

- (1) 1800 years (2) 1600 years (3) 3200 years (4) 4800 years

23. The vibrational degrees of freedom for (i) O_2 , (ii) N_2O , (iii) CH_2O , (iv) C_6H_6 , (v) $CHCl_3$ are respectively

(1) 3, 1, 6, 6, 30

(2) 1, 3, 9, 30, 6

(3) 1, 3, 6, 30, 6

(4) 3, 6, 9, 6, 15

24. The shift of an absorption maximum towards longer wavelength is known as

(1) hypsochromic effect

(2) bathochromic effect

(3) hyperchromic effect

(4) hypochromic effect

25. The actual value of nuclear spin depends on

(1) mass number

(2) atomic number

(3) both (1) and (2)

(4) shielding effect

26. The relationship between dihedral angle θ and vicinal coupling constant J_{HH} is given by Karplus equation which is

(1) $J_{HH} = 8.5 \cos \phi - 0.50$

(2) $J_{HH} = 9.5 \cos \phi - 0.30$

(3) $J_{HH} = 8.5 \cos^2 \phi - 0.28$

(4) $J_{HH} = 3.8 \cos \phi - 0.40$

27. Centrifugal forces due to rotation of molecule about any given axis will tend to

(1) increase the moment of inertia about the axis

(2) decrease the effective rotational constant

(3) both (1) and (2)

(4) None of these

28. Which of the following is correct for photochemical reactions?

(1) Temperature has the same effect as on thermal reaction

(2) Temperature has opposite effect as on thermal reaction

(3) Temperature has no effect in the photochemical reaction

(4) None of these

29. Chemisorption first increases and then decreases with increase in temperature because

(1) $\Delta H = -ve$

(2) $\Delta S = -ve$

(3) ϵ_a is high

(4) ϵ_a is low

30. The gold numbers of A, B, C and D are 0.04, 0.002, 10 and 25 respectively. The protective powers of A, B, C and D are

(1) $B > A > C > D$

(2) $A > B > C > D$

(3) $D > C > A > B$

(4) $B > A > D > C$

31. When KCl is heated in an atmosphere of K the violet colour appears which is due to

(1) the electrons diffuse into the crystal and occupy the vacant sites created by Cl^- ions

(2) the electrons diffuse into the crystal and occupy the vacant sites

(3) the K^+ ions diffuse into the crystal and occupy the vacant sites created by Cl^- ions

(4) None of these

32. For a simple cubic system the spacing of (100), (110) and (111) planes are in the ratio of

- (1) $1 : \frac{1}{\sqrt{2}} : \frac{1}{\sqrt{3}}$ (2) $\frac{1}{\sqrt{2}} : \frac{1}{\sqrt{3}} : 1$ (3) 1:1:1 (4) $\sqrt{3} : \sqrt{2} : 1$

33. Which of the following sets of quantum numbers is correct for an electron in 4f orbital?

- (1) $n = 4, l = 3, m = +4, s = +\frac{1}{2}$ (2) $n = 4, l = 4, m = -4, s = -\frac{1}{2}$
 (3) $n = 4, l = 3, m = +1, s = +\frac{1}{2}$ (4) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$

34. The ionisation energy of hydrogen atom is 13.6 eV. What will be the ionisation energy of He^+ ?

- (1) 13.6 eV (2) 54.4 eV (3) 122.4 eV (4) zero

35. BaSO_4 is insoluble in water because

- (1) hydration energy is equal to lattice energy
 (2) hydration energy is more than lattice energy
 (3) lattice energy is more than hydration energy
 (4) BaSO_4 does not form hydrogen bonds with water molecules

36. Which of the following combination of atoms of A and B forms bonding molecular orbitals?

- (1) $(\psi_A - \psi_B)$ (2) $(\psi_A + \psi_B)$ (3) $(\psi_A \times \psi_B)$ (4) $\frac{\psi_A}{\psi_B}$

37. Which of the following processes involves increasing in bond order?

- (1) $\text{N}_2 \rightarrow \text{N}_2^+ + e^-$ (2) $\text{CO} + e^- \rightarrow \text{CO}^-$
 (3) $\text{NO} \rightarrow \text{NO}^+ + e^-$ (4) $\text{O}_2 + e^- \rightarrow \text{O}_2^-$

38. In which salt are the anion and cation iso-electronic?

- (1) LiF (2) NaCl (3) KCl (4) KBr

39. Oxygen may be prepared by heating potassium chlorate. What is the other product?
- (1) Potassium oxide (2) Potassium chloride
(3) Potassium hypochlorite (4) Potassium chlorite
40. Radioactive decay of radon produces lead. What would be the other product/products?
- (1) Alpha particles (2) Neutrons
(3) Neutrons and polonium (4) Alpha particles and polonium
41. From each pair given below identify the ion which is larger in size
[Co²⁺, Co³⁺] [Fe²⁺, Zn²⁺] [Na⁺, F⁻] [O²⁻, S²⁻]
- (1) Co²⁺, Zn²⁺, F⁻, S²⁻ (2) Co³⁺, Fe²⁺, Na⁺, S²⁻
(3) Co²⁺, Fe²⁺, F⁻, S²⁻ (4) Co³⁺, Zn²⁺, Na⁺, O²⁻
42. Which one, among the given atoms, has the highest number of unpaired electrons in its ground state?
- (1) C (2) N (3) O (4) F
43. How many unpaired electrons are there in an atom of silver in its ground state?
- (1) 0 (2) 1 (3) 2 (4) 4
44. How many moles of P₄O₁₀ will react with one mole of water?
- (1) 2 moles (2) 6 moles (3) $\frac{1}{3}$ mole (4) $\frac{1}{6}$ mole
45. If 22 g of N₂O₅ reacts with 10 g of water to produce 22 g of nitric acid. What is the percentage yield of nitric acid?
- (1) 32 (2) 69 (3) 87 (4) 100

46. 10 ml of 0.10 N sodium hydroxide is added to 20 ml 0.10 N sulphuric acid and the resultant solution is titrated against 0.10 N sodium hydroxide. What will be the titre value at the end point?
- (1) 5 ml (2) 10 ml (3) 20 ml (4) 30 ml
47. An aqueous solution of a substance gives a white precipitate when a few drops of sodium hydroxide are added. The precipitate dissolves when excess of sodium hydroxide is added. The substance may be
- (1) aluminium sulphate (2) silver nitrate
(3) cadmium chloride (4) mercuric chloride
48. Which reagent may be used to precipitate barium from aqueous solutions?
- (1) Hydrochloric acid (2) Sulphuric acid
(3) Silver nitrate (4) Ammonium chloride
49. An element crystallizes in an FCC lattice. How many atoms are there per unit cell?
- (1) 1 (2) 2 (3) 3 (4) 4
50. A non-stoichiometric oxide of silver has composition $\text{Ag}_{1.8}\text{O}$. What percentage of Ag is present in the form Ag^{2+} ?
- (1) 11 (2) 14 (3) 20 (4) 25
51. A sample of water contains 200 ppm of Ca^{2+} in it. What is the molality of the solution with respect to Ca? (At mass of Ca = 40)
- (1) 0.2 m (2) 2 m (3) 5×10^{-3} m (4) 0.05 m
52. What is the charge (n) on the silicate ion Si_2O_7^n ?
- (1) -2 (2) -4 (3) -6 (4) -7

59. CuI_2 is unstable because, it readily decomposes to
(1) Cu and I^- (2) Cu and I_2 (3) CuI and I_2 (4) CuI and I^-
60. Which one among the chlorides ZnCl_2 , HgCl_2 , BaCl_2 , AlCl_3 , is dissociated to the least extent in aqueous solutions?
(1) ZnCl_2 (2) HgCl_2 (3) BaCl_2 (4) AlCl_3
61. Which one, among the given ions, has the highest polarizing power?
(1) Na^+ (2) Ca^{2+} (3) Mg^{2+} (4) Al^{3+}
62. Which compound can act as a Lewis acid as well as a Lewis base?
(1) H_2O (2) SnCl_2 (3) NH_3 (4) BF_3
63. Perovskite is the mineral CaTiO_3 . The perovskite crystal structure is adopted by several oxides as well as some fluorides. Which one, among the given formulae; most likely represents a known fluoride having the perovskite structure?
(1) CaTiF_3 (2) KZnF_3 (3) CaTiF_5 (4) CaMgF_4
64. CsF adopts the NaCl crystal structure. If the unit cell edge is of length 4.02 \AA , what is the shortest distance between the cation and anion in the crystal?
(1) 2.01 \AA (2) 2.84 \AA (3) 3.48 \AA (4) 4.02 \AA
65. The boron mineral, borax contains the anion, $[\text{H}_4\text{B}_4\text{O}_9]^{2-}$. What is the formal oxidation number of B in this anion?
(1) 2.5 (2) 3 (3) 3.5 (4) 4
66. In its reaction with aqueous solutions of Cu^{2+} , the cyanide ion is similar to
(1) CO (2) Cl^- (3) I_2 (4) I^-

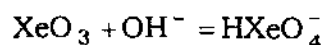
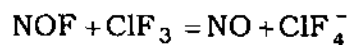
67. Which ligand can lead to linkage isomers?
 (1) Azide (2) Cyanate (3) Oxalate (4) Nitrate
68. If you were to prepare $[\text{Cr}(\text{oxalate})_2(\text{OH}_2)_2]^-$ ion, how many isomers, including geometrical and optical, can you expect to get?
 (1) Only one (2) Two (3) Three (4) Four
69. Two isomers are obtained for $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$, while only one isomer is obtained for $\text{Ni}(\text{NH}_3)_2\text{Cl}_2$. This is because
 (1) the two complexes differ in the oxidation state of the metal
 (2) the two complexes differ in the oxidation state of the metal as well as coordination number
 (3) the two complexes differ in their coordination number
 (4) the two complexes differ in their coordination geometry

70. Consider the following reaction



The above reaction involves

- (1) substitution (2) substitution and reduction
 (3) oxidation (4) substitution and oxidation
71. Identify the acids in the following two reactions



- (1) ClF_3 and XeO_3 (2) ClF_3 and OH^-
 (3) NOF and OH^- (4) NOF and XeO_3

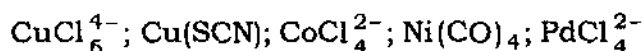
72. What are the formal oxidation states of the iron atoms labelled (A) and (B) in the compound $\text{Fe}_4^{(A)}[\text{Fe}^{(B)}(\text{CN})_6]_3$?

- (1) $\text{Fe}^{(A)}, 2+$ and $\text{Fe}^{(B)}, 3+$ (2) $\text{Fe}^{(A)}, 2+$ and $\text{Fe}^{(B)}, 4+$
 (3) $\text{Fe}^{(A)}, 3+$ and $\text{Fe}^{(B)}, 3+$ (4) $\text{Fe}^{(A)}, 3+$ and $\text{Fe}^{(B)}, 2+$

73. The magnetic moment of $\text{Co}(\text{H}_2\text{O})_6^{3+}$ is zero and that of $\text{Mn}(\text{CN})_6^{3-}$ is 2.9 BM. From this it may be concluded that

- (1) both ions are high spin
 (2) both ions are low spin
 (3) $\text{Co}(\text{H}_2\text{O})_6^{3+}$ is low spin, $\text{Mn}(\text{CN})_6^{3-}$ is high spin
 (4) $\text{Co}(\text{H}_2\text{O})_6^{3+}$ is diamagnetic, $\text{Mn}(\text{CN})_6^{3-}$ is high spin

74. Which among the following compounds/ions are diamagnetic?



- (1) CoCl_4^{2-} and PdCl_4^{2-} (2) CuCl_6^{4-} , $\text{Cu}(\text{SCN})$ and $\text{Ni}(\text{CO})_4$
 (3) $\text{Cu}(\text{SCN})$ and $\text{Ni}(\text{CO})_4$ (4) $\text{Cu}(\text{SCN})$, $\text{Ni}(\text{CO})_4$ and PdCl_4^{2-}

75. Which one is an example of a 'sandwich' compound?

- (1) $\text{Cr}(\text{C}_6\text{H}_6)_2$ (2) $\text{Cr}(\text{CO})_6$
 (3) $\text{Cr}_2(\text{CH}_3\text{COO})_2$ (4) $[\text{Pt}(\text{NH}_3)_2][\text{PtCl}_4]$

76. Adsorption chromatography is also known as

- (1) liquid-liquid chromatography (2) liquid-gas chromatography
 (3) liquid-solid chromatography (4) paper chromatography

77. Planar chromatographic method includes

(A) high-performance liquid chromatography

(B) thin-layer chromatography

(C) paper chromatography

(D) electrochromatography

(1) only A

(2) both A and B

(3) B, C and D

(4) A, B and C

78. The plate count in column chromatography is given by

$$(1) N = 16 \left(\frac{t_R}{W} \right)^2$$

$$(2) \frac{N}{16} = \left(\frac{t_R}{W} \right)$$

$$(3) N = 16 \left(\frac{t_R^2}{W} \right)$$

$$(4) \frac{N}{16} = \frac{W^2}{t_R}$$

(t_R = retention time, W = peak width)

79. Twenty millilitres of an aqueous solution of 0.10 M butyric acid is shaken with 10 mL ether. After the layers are separated, it is determined by titration that 0.5 m mol butyric acid remains in the aqueous layer. The distribution ratio in this case is

(1) 0.6

(2) 6.0

(3) 0.06

(4) 6.5

80. In countercurrent distribution, the fraction, $F_{r,n}$, of solute contained in the r th tube after n transfers using equal volumes of the two solvents is given by

$$(1) F_{r,n} = \frac{\binom{n}{r}}{\binom{n}{n-r}} \left(\frac{1}{D+1} \right)^n D^r$$

$$(2) F_{r,n} = \frac{\binom{n}{r}}{\binom{n}{n-r}} \left(\frac{1}{D+1} \right)^n D^r$$

$$(3) F_{r,n} = \frac{\binom{n}{r}}{\binom{n}{n-r}} \left(\frac{1}{D+1} \right)^n D^r$$

$$(4) F_{r,n} = \frac{\binom{n}{r}}{\binom{n}{n-r}} \left(\frac{D+1}{D} \right)^n D^r$$

81. Which one is semi-microanalysis?

- (1) >0.1 g (2) 0.01 to 0.10 g
 (3) 0.001 to 0.01 g (4) $<10^{-4}$ g

82. Which one is trace analyte level?

- (1) 1% to 100% (2) 0.01% to 1.0%
 (3) 1 ppb to 100 ppm (4) <1 ppb

83. ppb amount is

- (1) $\frac{g}{L}$ (2) $\frac{\mu g}{L}$ (3) $\frac{mg}{L}$ (4) $\frac{ng}{L}$

84. The result $\text{antilog } 12.5 = 3.162277 \times 10^{12}$ can be represented better by retaining significant digits as

- (1) $\text{antilog } 12.5 = 3 \times 10^{12}$ (2) $\text{antilog } 12.5 = 3.2 \times 10^{12}$
 (3) $\text{antilog } 12.5 = 3.1 \times 10^{12}$ (4) $\text{antilog } 12.5 = 3.162 \times 10^{12}$

85. The equation for the normal error curve is

- (1) $y = \frac{e^{-z^2/2}}{\sigma \sqrt{2\pi}}$ (2) $y = \frac{e^{-z^2/2} \cdot \sigma}{\sqrt{2\pi}}$
 (3) $y = \frac{e^{z^2/2}}{\sigma \sqrt{2\pi}}$ (4) $y = \frac{e^{-z^2/2} \cdot \sqrt{2\pi}}{\sigma}$

86. The coefficient of variation is

- (1) % relative standard deviation (2) relative standard deviation
 (3) standard deviation (4) square of the standard deviation

87. The analysis of a calcite sample yields CaO percentage of 55.95, 56.00, 56.04, 56.08 and 56.23. The last value appears anomalous and rejection quotient at 95% confidence level is 0.71. Should the last value be rejected or retained at 95% confidence level?

- (1) Retained (2) Rejected
 (3) All are acceptable (4) Cannot say

88. Standard EDTA (H_4Y) solution is ordinarily prepared by dissolving weighed amount of

- (1) $Na_2H_2Y \cdot 2H_2O$ (2) Na_2H_2Y
 (3) NaH_3Y (4) Na_3HY

89. Which is the optimum velocity according to van Deemter plot?

- (1) $U_{opt} = \sqrt{\frac{B}{C}}$ (2) $U_{opt} = \sqrt{\frac{AB}{C}}$ (3) $U_{opt} = \frac{B}{\sqrt{C}}$ (4) $U_{opt} = \frac{\sqrt{B}}{C}$

90. Quadrivalent cerium is widely used in redox titration because

- (1) it is cheaper
 (2) it can be easily prepared
 (3) its aqueous solution is highly stable
 (4) its aqueous solution can be standardized easily

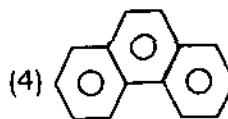
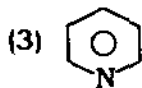
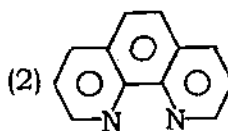
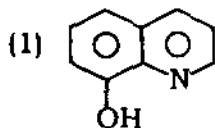
91. If you do not have eriochrome black-T indicator for the complexometric titration of a metal, which following option is left with you?

- (1) Able to perform titration without indicator
 (2) Able to perform titration using phenolphthalein
 (3) Wait until eriochrome black-T is procured
 (4) Cannot be able to perform titration

92. Eriochrome black-T can be used in EDTA titration at pH 7 because

- (1) end point is indicated by a contrast colour change
- (2) it is stable at this pH
- (3) EDTA is stable at this pH
- (4) buffer of pH 7 can easily be prepared

93. Ferroin is ferrous complex of



94. Mg^{2-} can be precipitated by oxine using metaloxine ratio

- (1) 1:4
- (2) 1:2
- (3) 1:1
- (4) 2:1

95. Von Weimarn ratio depicts the relative supersaturation (Q') of solution during the precipitation process in term of the degree of supersaturation (Q) and solubility (S) of precipitate in the manner $Q' = \frac{Q-S}{S}$. The favourable condition for the precipitation is

- (1) keep Q low and S high
- (2) keep Q high and S low
- (3) keep Q and S both low
- (4) kept Q and S both high

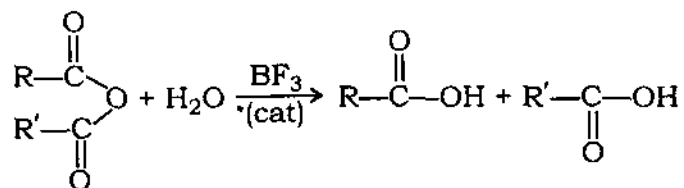
96. Phenol can be quantitatively determined by

- (1) complexation reaction
- (2) precipitation titration
- (3) bromate-bromide reaction
- (4) gravimetric estimation

97. How many moles of Br_2 are generated if 3 moles of KBrO_3 are reacted with 15 moles of KBr ?

- (1) 6 (2) 9 (3) 15 (4) 1

98. Select the procedure which you recommend for the quantification of organic compound(s) involved in the following reaction

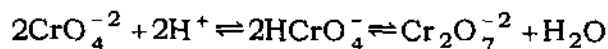


- (1) Malaprade oxidation (2) Karl Fisher titration
(3) Cerate titration (4) Bromate oxidation

99. The best photometric accuracy can be had within the following range of transmittance (T)

- (1) 20-80% T (2) 30-90% T (3) 15-65% T (4) 65-100% T

100. Aqueous solution of potassium chromate offer a typical example of an apparent deviation from Beer's law which may be attributed to unsymmetrical chemical equilibria



Predict the condition under which the Beer's law can be obeyed

- (1) Dilute the potassium chromate solution
(2) Make the strongly alkaline solution of potassium chromate
(3) Make the moderately alkaline solution of potassium chromate
(4) Make the neutralized solution (pH 7.0) of potassium chromate

101. Potassium bromate in basic solution exhibits an absorption maximum of 372 nm. A basic solution containing 3.00×10^{-5} M KBrO_3 transmits 10% of the incident radiation at 372 nm when it is placed in a 1.0 cm cell. The absorbance of this solution is
 (1) 0 (2) 1 (3) 2 (4) 3
102. The pH at the end point for the titration of weak acid is
 (1) 7 (2) >7 (3) <7 (4) 0
103. The pH of 10^{-2} M NaOH solution is
 (1) 2 (2) 12 (3) 5 (4) 9
104. In the potentiometric titration of Fe^{+2} with Ce^{+4} , the equivalence point potential can be computed as
 (1) $E = E_{\text{Fe}}^{\circ} + E_{\text{Ce}}^{\circ}$ (2) $E = \frac{E_{\text{Fe}}^{\circ} + E_{\text{Ce}}^{\circ}}{2}$
 (3) $E = \frac{E_{\text{Fe}}^{\circ} - E_{\text{Ce}}^{\circ}}{2}$ (4) $E = E_{\text{Fe}}^{\circ} - E_{\text{Ce}}^{\circ}$
105. Chloramine-T acts as if it is
 (1) a metallochromic-indicator
 (2) a pH-indicator
 (3) a highly reactive sodium hypochlorite
 (4) a redox-indicator
106. The molar absorptivity has the unit
 (1) L mol cm^{-1} (2) $\text{L}^{-1} \text{mol}^{-1} \text{cm}$
 (3) $\text{L mol}^{-1} \text{cm}^{-1}$ (4) No unit
107. In the isotropic dilution method
 (1) known weight of isotropically labelled species is mixed with the sample
 (2) any amount of isotropically labelled species is mixed with the sample
 (3) half of the sample amount is mixed with the isotropically labelled species
 (4) dilution is necessary with water

108. Which one is pertinent receptor of photochemical smog?

- (1) Ocean (2) Plant (3) Soil (4) Man

109. Which one is sink of CO₂?

- (1) Soil (2) Ocean (3) Plant (4) Air

110. Which one is contaminant?

- (1) CO (2) Mercury (3) SO₂ (4) Chlorine

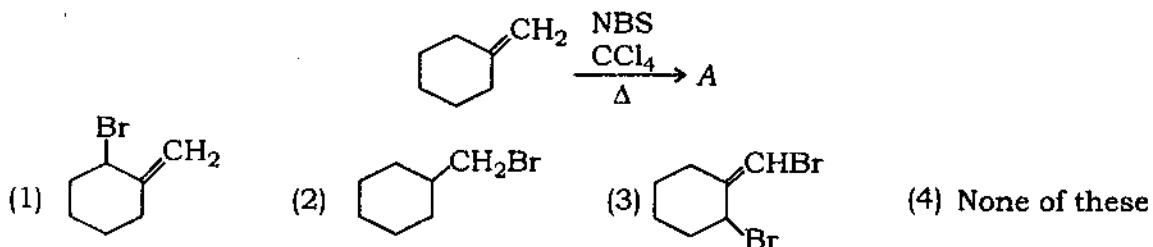
111. Which one is more toxic?

- (1) Hg (2) Hg²⁺ (3) Hg₂²⁺ (4) (CH₃)₂Hg

112. What happens when there is rise in CO₂ emission in the air?

- (1) Global warming (2) Global cooling
(3) Storm (4) Acid rain

113. The major organic product in the following reaction is



114. An S_N2 reaction at an asymmetric carbon atom of a dextro alkyl halide always gives a

- (1) laevo product (2) racemic mixture
(3) single optically active isomer (4) dextro product

115. Aqueous solution of phenol is known as

- (1) benzoic acid (2) carboic acid (3) phenoxide (4) None of these

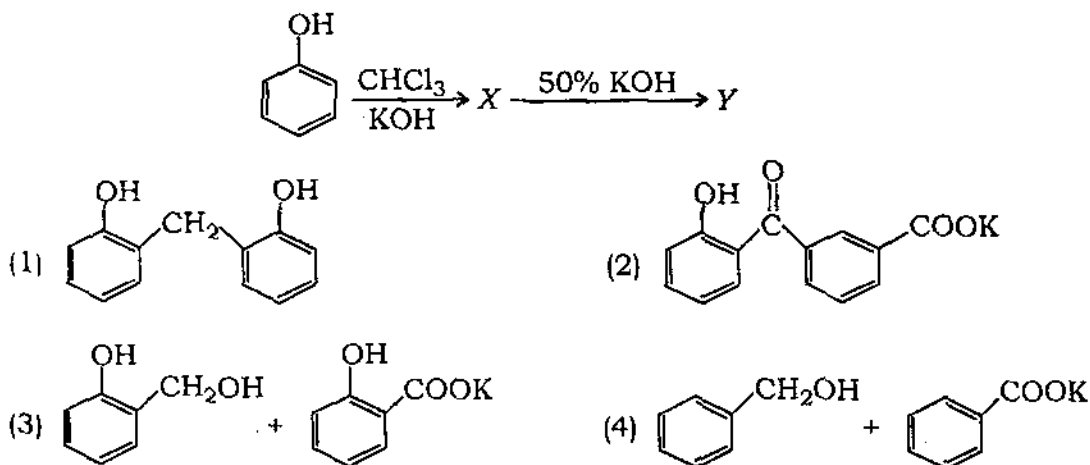
116. What happens when 1-naphthalenesulphonic acid is heated in sulphuric acid at 160 °C?

- (1) Naphthalenesulphonic acid is obtained in major amount
- (2) A mixture of 2-naphthalenesulphonic acid and naphthalene-1,2-disulphonic acid is obtained
- (3) Naphthalene-1,2-disulphonic acid is obtained in major amount
- (4) 1-Naphthalenesulphonic acid is recovered

117. Clemmenson's reduction will convert cyclohexanone into

- (1) cyclohexanoic acid
- (2) cyclohexane
- (3) *n*-hexane
- (4) benzene

118. The final product(s) of the following reaction is/are



119. Which of the following does not reduce Tollens' reagent?

- (1) CH_3CHO
- (2) HCOOH
- (3) $\text{C}_6\text{H}_5\text{NHOH}$
- (4) $\text{C}_6\text{H}_5\text{NH}_2$

- 120.** Reaction of ethyne with HCN in presence of $\text{Ba}(\text{CN})_2$ is an example of
- (1) electrophilic addition (2) nucleophilic addition
(3) free radical addition (4) electrophilic substitution
- 121.** An alkene on ozonolysis gives two moles of glyoxal and two moles of methanal. The molecular formula of alkene is
- (1) C_6H_8 (2) C_8H_{12} (3) C_8H_{14} (4) C_7H_{10}
- 122.** Out of the following name reactions which gives unsymmetrical alkane?
- (1) Wurtz reaction (2) Corey-House reaction
(3) Decarboxylation reaction (4) Frankland reaction
- 123.** Consider the following carbocations
- (A) $\text{C}_6\text{H}_5\text{CH}_2^+$ (B) $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2^+$
(C) $\text{C}_6\text{H}_5\text{CH}^+\text{CH}_3$ (D) $\text{C}_6\text{H}_5\text{C}^+(\text{CH}_3)_2$
- The correct sequence for the stability of these is
- (1) A, B, C, D (2) B, C, A, D
(3) D, C, A, B (4) D, C, B, A
- 124.** Hypsochromic effect is also known as
- (1) red shift (2) blue shift
(3) bathochromic shift (4) None of these

125. Fenton's reagent is used in

- (1) mutarotation (2) Killiani-Fischer synthesis
(3) Ruff degradation (4) Wohl degradation

126. When 2-chloro-2-methylbutane is refluxed with alcoholic KOH, the main product obtained is

- (1) $(\text{CH}_3)\text{C}=\text{CHCH}_3$ (2) $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}_2\text{CH}_3$
(3) $\text{CH}_2=\text{C}(\text{CH}_3)\text{CH}_2\text{CH}_3$ (4) $(\text{CH}_3)_3\text{CCH}_2\text{OH}$

127. Which of the following is a polyamide molecule?

- (1) Terylene (2) Rayon (3) Polystyrene (4) Nylon 6

128. Which one of the following pairs can be distinguished by Fehling solution?

- (1) Glucose and Fructose (2) Glucose and Mannose
(3) Fructose and Sucrose (4) Maltose and Glucose

129. Piperine on hydrolysis with KOH gives

- (1) piperidine and piperic acid and this shows the presence of an amide group
(2) piperidine and piperic acid and this shows the presence of an ester group
(3) pyridine and piperic acid and this shows the presence of an amide group
(4) pyridine and piperic acid and this shows the presence of an ester group

- 130.** Which of the following statements is correct?
- (1) Citral-a is also known as geranial and exists in Z form
 - (2) Citral-a is also known as geranial and exists in E form
 - (3) Citral-b is also known as neral and exists in E form
 - (4) Citral-a and citral-b represent the same compound
- 131.** Which of the following rearrangements involves nitrene as intermediate?
- (1) Beckmann
 - (2) Hofmann
 - (3) Baeyer-Villiger
 - (4) Pinacol-pinacolone
- 132.** Preferred conformations of cyclohexane and methylcyclohexane, respectively are
- (1) chair and chair with equatorial methyl
 - (2) chair and chair with axial methyl
 - (3) boat and chair with equatorial methyl
 - (4) boat and boat with equatorial methyl
- 133.** Propiophenone on reaction with phenylhydrazine followed by treatment with $ZnCl_2$ gives
- (1) 2-propylindole
 - (2) 2-propionylindole
 - (3) 2-ethylindole
 - (4) 2-methylindole
- 134.** The correct order of migratory aptitude of the groups in Baeyer-Villiger oxidation is
- (1) phenyl > *p*-chlorophenyl > *p*-methoxyphenyl > *p*-hydroxyphenyl
 - (2) *p*-chlorophenyl > *p*-methoxyphenyl > *p*-hydroxyphenyl > phenyl
 - (3) *p*-methoxyphenyl > *p*-hydroxyphenyl > phenyl > *p*-chlorophenyl
 - (4) *p*-hydroxyphenyl > phenyl > *p*-methoxyphenyl > *p*-chlorophenyl

135. An aqueous solution of D-glucose in equilibrium contains
- (1) α - and β -anomers in equal amounts
 - (2) α -anomer in major amount and β -anomer in minor amount
 - (3) α -anomer in minor amount and β -anomer in major amount
 - (4) α - and β -anomers in variable amounts
136. The Chichibabin reaction of pyridine gives
- (1) 2-aminopyridine in good yield along with trace amount of 4-aminopyridine
 - (2) 2-aminopyridine in good yield along with trace amount of 3-aminopyridine
 - (3) 4-aminopyridine in good yield along with trace amount of 2-aminopyridine
 - (4) only 4-aminopyridine
137. Bakelite is obtained from phenol by the reacting with
- (1) HCHO
 - (2) CH_3OH
 - (3) CH_3CHO
 - (4) CH_3COCH_3
138. Which synthesis can be applied for quinoline?
- (1) The Skraup synthesis only
 - (2) The Bischler-Napieralski and Skraup synthesis
 - (3) The Pomeranz-Fritsch synthesis only
 - (4) The Skraup and Friedlander synthesis
139. Hofmann's exhaustive methylation of piperidine gives
- (1) 1,4-pentadiene
 - (2) 1,3-pentadiene
 - (3) 1,3-butadiene
 - (4) 1,3-cyclopentadiene

140. Which of the following is an auxochrome?

- (1) $C=C$ (2) $-CO-$ (3) C_6H_5- (4) $-NH_2$

141. Isoelectric point is the point, where concentration of dipolar ion is

- (1) minimum (2) maximum
(3) intermediate (4) Can be of any value

142. Plexiglass is a commercial name of

- (1) polyacrylonitrile (2) glyptal
(3) polymethylmethacryl (4) polyethylmethacryl

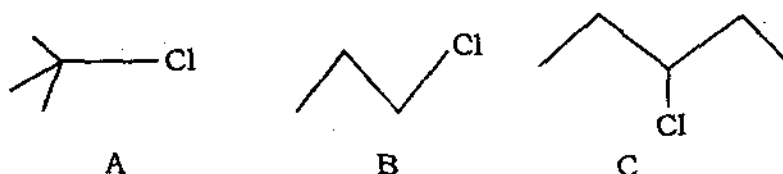
143. Which amine will be used as starting material in the Pictet-Spengler synthesis of isoquinoline?

- (1) Benzylamine (2) Aniline
(3) 2-Phenylethylamine (4) 2-Propylamine

144. What will be the effect on the rate of S_N2 type reaction if the concentration of MeI is doubled and that of OH^- is halved?

- (1) The rate becomes 2 times faster
(2) The rate becomes 4 times faster
(3) The rate becomes half
(4) No change in the rate

145. Using given codes, arrange the following compounds in decreasing order of the rate of solvolysis by S_N1 mechanism



Code :

- (1) $A > C > B$ (2) $C > B > A$ (3) $A > B > C$ (4) $B > A > C$
146. 1,3-Dichloropropane on reaction with Zn and NaI gives

- (1) propane (2) 1-chloropropane
(3) cyclohexane (4) cyclopropane

147. Which one of the following is aromatic?



148. Which of the following compounds is most stable?



149. A nonapeptide undergoes partial hydrolysis to give peptides whose amino acid compositions are shown (A-H). Reaction of intact nonapeptide with Edman's reagent releases PTH-Leu. What is the sequence of the nonapeptide?

- (A) Pro, Ser (B) Gly, Glu (C) Met, Ala, Leu (D) Gly, Ala
(E) Glu, Ser, Val, Pro (F) Glu, Pro, Gly
(G) Met, Leu (H) His, Val

Options are

- (1) Leu-Met-Ala-Gly-Glu-Pro-Ser-Val-His
(2) Leu-Ala-Met-Gly-Glu-Pro-Ser-Val-His
(3) Leu-Met-Ala-Glu-Gly-Pro-Ser-Val-His
(4) Leu-Met-Ala-Gly-Glu-Pro-Ser-His-Val

150. Which is least aromatic?

- (1) Pyrrole (2) Furan (3) Thiophene (4) Benzene

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली या काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में लिफाफा रहित प्रवेश-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा, केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।
4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।
5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।
6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ० एम० आर० पत्र सं० की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।
7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।
9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ़ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ०एम०आर० उत्तर-पत्र परीक्षा भवन में जमा कर दें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।