

13P/206/4

Question Booklet No.....

(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.



13P/206/4

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 प्रामांक 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. Figures defining precision do not include

- (1) absolute standard deviation (2) relative standard deviation
(3) coefficient of variance ✓ (4) limit of detection

2. Which of the following statements is false?

- (1) A precise measurement may be inaccurate
(2) An accurate measurement is always precised
✓ (3) Accuracy applies only to attribute data whereas precision to attribute both simple data and geographic data
(4) High accuracy and high precision are both expensive and difficult to aquire

(312)

3. Absorption chromatography is also known as
- (1) liquid-liquid chromatography (2) liquid-gas chromatography
(3) liquid-solid chromatography (4) paper chromatography
4. Adsorption chromatography is the best separation technique for
- (1) charged species (2) non-polar compounds
(3) compounds bearing lone pairs (4) compounds bearing halide groups
5. Which one of the following is 2-D chromatography?
- (1) Gas chromatography (2) HPLC
(3) Paper chromatography (4) Ion-exchange chromatography
6. Which one of the following is not a planar chromatography?
- (1) High performance liquid chromatography
(2) High performance thin layer chromatography
(3) Paper chromatography
(4) Electrochromatography
7. The precision of the mean of a series of N measurements can be better represented as
- (1) S/\sqrt{N} (2) S/N (3) $S/\sqrt{N-1}$ (4) $S/N-1$
8. The efficiency of a chromatographic column can be increased by
- (1) increasing plate height (2) decreasing plate height
(3) increasing length of the column (4) decreasing length of the column

9. The number of plates (N) can be computed in terms of the retention time of a peak t_R and the width of the peak at its base W by the relationship

(1) $N = 16 \left(\frac{W}{t_R} \right)^2$ (2) $N = 16 \left(\frac{t_R}{W} \right)^2$ (3) $N = 16 \left(\frac{t_R}{W} \right)^{1/2}$ (4) $N = 16 \left(\frac{W}{t_R} \right)^{1/2}$

10. EDTA stands for

- (1) ethylene diamine tetraacetic acid
 (2) disodium salt of ethylene diamine tetraacetic acid
 (3) tetrasodium salt of ethylene diamine tetraacetic acid
 (4) ethylene diamine

~~X~~ wrong

11. Liquid-liquid chromatography is also called as

- (1) ion-exchange chromatography (2) affinity chromatography
 (3) adsorption chromatography (4) partition chromatography

12. The reverse-phase chromatography is one

- (1) in which the stationary phase is polar and mobile phase is non-polar
 (2) in which the stationary phase is non-polar and mobile phase is polar
 (3) in which both phases are non-polar
 (4) in which both phases are polar

13. The solute polarities are in the order $A > B > C$. In reverse-phase chromatography the order of elution will be

- (1) $A > B > C$ (2) $C > B > A$ (3) $B > C > A$ (4) $B > A > C$

14. Which statement(s) are true?

- (A) Cation-exchange resins have primary amine groups
 (B) Cation-exchange resins have sulfonic acid groups
 (C) Anion-exchange resins have tertiary amine groups
 (D) Anion-exchange resins have carboxylic acid groups

Answer codes

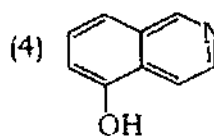
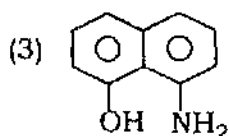
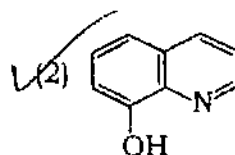
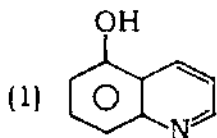
- (1) (A) and (D) (2) (B) and (C) (3) (A) and (C) (4) (B) and (C)

~~misprint~~
 ↓
(4) (B) and (C)

15. Which statement is correct?

- (1) Ion-exchange and ion-exclusion chromatography are same techniques
 ✓(2) Ion-exchange and ion-chromatography are same techniques
 (3) Adsorption and partition chromatography as same techniques
 (4) Ion-paired and ion-exclusion chromatography are same techniques

16. Identify the structure of oxine



17. Oxine forms complexes with metal ions in

- ✓(1) deprotonated state (2) protonated state
 (3) neutral state (4) zwitterionic state

18. One mole of potassium bromate in bromate-bromide reaction produces
- (1) one mole Br_2 (2) two moles Br_2
 (3) three moles Br_2 (4) four moles Br_2
19. Which one is redox indicator?
- (1) Methyl red (2) Fluorescein (3) Ferroin (4) Phenolphthalein
20. Which Ce(IV) solution is stable enough for a year or at 100 °C temperature?
- (1) Basic Ce(IV) solution (2) Acidic Ce(IV) solution
(3) Neutral Ce(IV) solution (4) Complex form of Ce(IV) solution
21. As(III) oxide is used in standardizing oxidizing reagent as a primary standard. The best method to prepare a standard solution of As(III) oxide is
- (1) dissolving weighed amount of As_2O_3 in water
(2) dissolving weighed amount of As_2O_3 in acidic water
 (3) dissolving weighed amount of As_2O_3 in a basic water followed by neutralisation with an acid
(4) dissolving weighed amount of As_2O_3 in acid followed by neutralisation with a base
22. If you do not have Eriochrome Black-T for complexometric titration, can you perform this titration?
- (1) Not at all
 (2) Yes, with the use of an alternative indicator like phenolphthalein.
(3) Yes, with the use of an alternative indicator like ferroin
(4) Wait until a suitable metallochromic indicator is procured

23. EDTA often combines with metal ion (regardless the charge on the cation) in the ratio of

- (1) 1:4 (2) 1:3 (3) 1:2 ✓(4) 1:1

24. Metal ions through oxinate precipitation can be estimated by

- ✓(1) bromate titration (2) direct titration
 (3) back titration (4) colourimetric titration

25. EDTA titrations require a buffer of pH

- (1) 12 ✓(2) 10 (3) 4 (4) 6

26. In the titration of iron(II) with cerium(IV), the equivalence point potential (E_{eq}) is

- (1) $E_{eq} = E_{Fe^{3+}/Fe^{2+}}^{\circ} + E_{Ce^{4+}/Ce^{3+}}^{\circ}$ ✓(2) $E_{eq} = \frac{E_{Fe^{3+}/Fe^{2+}}^{\circ} + E_{Ce^{4+}/Ce^{3+}}^{\circ}}{2}$
 (3) $E_{eq} = 2(E_{Fe^{3+}/Fe^{2+}}^{\circ} + E_{Ce^{4+}/Ce^{3+}}^{\circ})$ (4) $E_{eq} = E_{Ce^{4+}/Ce^{3+}}^{\circ} - E_{Fe^{3+}/Fe^{2+}}^{\circ}$

27. In the following potentiometric titration curve for the determination of chloride with silver nitrate

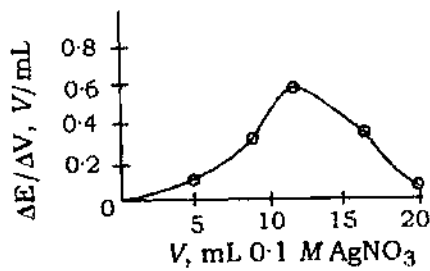


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the equivalence point is

- (1) 10 mL (2) 20 mL (3) 15 mL (4) 22 mL

33. The unit of 'molar absorptivity' is

- (1) $L \text{ mol cm}^{-1}$ (2) $L \text{ mol cm}$
~~(3) $L^{-1} \text{ mol}^{-1} \text{ cm}^{-1}$~~ (4) $L \text{ mol}^{-1} \text{ cm}^{-1}$

34. Beer's law is obeyed for a complex when it is formed by taking

- (1) metal in large excess
 (2) ligand in large excess
 (3) metal : ligand mole ratio 1:0
 (4) metal : ligand mole ratio greater than 1:0

35. Beer's law is obeyed in the case of an aqueous solution of a weak acid, if

- (1) solution is made acidic (2) solution is made basic
 (3) solution is made neutral (4) solution is made dilute

36. A $7.25 \times 10^{-5} M$ $KMnO_4$ solution has transmittance 10%, when measured in a 2.10 cm cell at a wavelength of 525 nm. The absorbance of this solution is

- (1) 2.00 (2) 1.00 (3) 0.20 (4) 0.10

37. The distribution constant (K) for iodine between an organic solvent and water is 85. What is the concentration of I_2 remaining in the aqueous layer after extraction of 50.0 mL of $1.00 \times 10^{-3} M$ I_2 with the 50.0 mL of the organic solvent?

- (1) $1.00 \times 10^{-3} M$ (2) $5.28 \times 10^{-7} M$
 (3) $1.16 \times 10^{-5} M$ (4) $5.29 \times 10^{-10} M$

38. Green gases responsible for acid rains are

- (1) hydrocarbon and CO (2) CO_x and NO_x
 (3) NO_x and SO_x (4) CO and CO_2

39. Which ion is isoelectronic with F^- ?
- (1) Li^+ (2) Cl^- (3) Ca^{2+} (4) O^{2-}
40. How many protons are there in the nucleus of a ^{15}N atom?
- (1) 6 (2) 7 (3) 8 (4) 10
41. Which one of the following elements normally exists in the form of diatomic molecules?
- (1) Sodium (2) Aluminium (3) Xenon (4) Iodine
42. From each pair given below identify the ion which is smaller in size
 $[Co^{2+}, Co^{3+}] [K^+, Ca^{2+}] [Na^+, F^-] [S^{2-}, Se^{2-}]$
- (1) $Co^{2+}, K^+, F^-, S^{2-}$ (2) $Co^{3+}, Ca^{2+}, Na^+, S^{2-}$
 (3) $Co^{2+}, Ca^{2+}, F^-, S^{2-}$ (4) $Co^{3+}, K^+, Na^+, Se^{2-}$
43. Which one among the following molecules has a linear structure?
- (1) Hydrogen sulphide (2) Sulphur dioxide
 (3) Ozone (4) Hydrogen cyanide
44. What is the minimum volume of carbon dioxide at STP required to completely convert 1 mole of calcium oxide to calcium carbonate?
- (1) 22 L (2) 44 L (3) 56 L (4) 28 L
45. Which molecules form strong H-bonds?
- (1) $H-F$ and $H-Cl$ (2) H_2O and HCl
 (3) H_2O and H_2S (4) HF and H_2O

46. The bond angles in boron trifluoride molecule are
(1) 90 degrees (2) 109 degrees (3) 120 degrees (4) 104 degrees
47. Which one of the following sets contains one element each from s-block, p-block and d-block?
(1) Na, Rb, Fe (2) Cs, Ru, Bi (3) B, Br, Sr (4) Sc, Pt, Te
48. What is the maximum volume of oxygen at STP that will evolve when an aqueous solution containing 1 mole of hydrogen peroxide is boiled?
(1) 22 L (2) 11 L (3) 44 L (4) 6 L
49. 10 ml of 0.10 M sodium hydroxide is added to 10 ml 0.10 M sulphuric acid and the resultant solution is titrated against 0.20 M sodium hydroxide. What will be the titre value at the end point?
(1) 5 ml (2) 10 ml (3) 20 ml (4) 30 ml
50. A Lewis base
(1) acts as an electron pair donor (2) acts as an electron pair acceptor
(3) always ionizes to give protons (4) always ionizes to give hydroxide ions
51. What is the formal oxidation number of the element 'E' in the formula $[H_4E_4O_9]^{2-}$?
(1) 2.5 (2) 3 (3) 3.5 (4) 4
52. What is the charge (n) on the molecule $[Cr(C_5H_5)_2]^n$, where Cr is in the +2 oxidation state and C_5H_5 is the anion, cyclopentadienyl (-1)?
(1) 0 (2) -1 (3) -2 (4) +1

53. 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) barium chloride (2) aluminium chloride
(3) cadmium chloride (4) calcium chloride
54. Which reagent may be used to precipitate Fe^{2+} ions from aqueous solutions?
- (1) Sodium chloride (2) Barium chloride
(3) Ammonium chloride (4) Sodium hydroxide
55. Which is the most common oxidation state observed for the lanthanide elements in their compounds?
- (1) -1 (2) +2 (3) +3 (4) +4
56. Nickel forms a complex ion having formula NiCl_4^{2-} . From among the given statements, pick the correct combination
- (i) it is a nickel(II) complex
(ii) it is an octahedral complex
(iii) it is paramagnetic
(iv) nickel atom has a coordination number 4 in this complex
- (1) (i), (ii), (iv) (2) (ii), (iii), (iv)
(3) (i), (iii), (iv) (4) (i), (iv)
57. Pick all the gases from the list which dissolve in water to give an acidic solution
- (i) nitrogen (ii) carbon dioxide
(iii) sulphur dioxide (iv) sulphur trioxide
(v) ozone (vi) hydrogen bromide
- (1) (i), (iii), (iv), (vi) (2) (ii), (iii), (iv), (vi)
(3) (ii), (iii), (vi) (4) (ii), (iv), (vi)

58. What is the correct word to describe the geometry of XeF_4 ?
- (1) Spherical (2) Octahedral (3) Tetrahedral (4) Planar
59. Which one, among the given atoms, has the least number of unpaired electrons in its ground state?
- (1) C (2) N (3) O (4) F
60. How many unpaired electrons are there in an atom of zinc in its ground state?
- (1) 0 (2) 1 (3) 2 (4) 4
61. For the preparation of PF_3 , 3 moles of CaF_2 was reacted with 3 moles of PCl_3 . If the isolated yield of PF_3 was 1.8 moles, what is the percentage yield?
- (1) 30 (2) 60 (3) 80 (4) 90
62. An element crystallizes in a BCC lattice. How many atoms are there per unit cell?
- (1) 1 (2) 2 (3) 4 (4) 9
63. Which one, among the given ions, has the highest polarizing power?
- (1) K^+ (2) Na^+ (3) Ba^{2+} (4) Al^{3+}
64. Which compound can act as a Lewis acid as well as a Lewis base?
- (1) CO_2 (2) NH_3 (3) SnCl_2 (4) BF_3
65. Two isomers are obtained for $\text{Pd}(\text{NH}_3)_2\text{Cl}_2$, 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 geometry
(3) the two complexes differ in their coordination geometry
(4) the two complexes differ in their oxidation state of the metal and the number of unpaired electrons

66. Which statement(s) is (are) true?

- (i) High spin complexes are always paramagnetic
- (ii) Low spin complexes are always diamagnetic
- (iii) H_2O is more likely to form a low spin complex than CN^-
- (iv) Tetrahedral complexes are more likely to be low spin than high spin

- (1) (i), (ii), (iv) (2) (i) (3) (i), (ii) (4) (i), (ii) and (iii)

67. What products are formed when sulphur is oxidised by nitric acid?

- (1) SO_2 , N_2 and H_2O
- (2) SO_4^{2-} , NO and H_2O
- (3) H_2S , NO and H_2O
- (4) SO_4^{2-} , NO_2 and H_2O

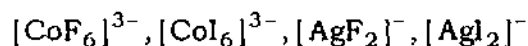
68. If Δ_o and Δ_t denote respectively, the octahedral and the tetrahedral crystal field splitting for a given metal ion and ligand with the same bond distance, then the ratio Δ_o/Δ_t is

- (1) 1.0 (2) 0.5 (3) 2.2 (4) 0.44

69. Which among the ions, $[\text{Cu}(\text{CN})_2]^-$, $[\text{Ag}(\text{NH}_3)_2]^+$, $[\text{Au}(\text{CN})_2]^-$, $[\text{Hg}(\text{NH}_3)_2]^{2+}$ is (are) diamagnetic?

- (1) $[\text{Cu}(\text{CN})_2]^-$ and $[\text{Au}(\text{CN})_2]^-$
- (2) All four of them
- (3) $[\text{Cu}(\text{CN})_2]^-$, $[\text{Ag}(\text{NH}_3)_2]^+$ and $[\text{Au}(\text{CN})_2]^-$
- (4) $[\text{Hg}(\text{NH}_3)_2]^{2+}$

76. Identify a pair of ions from the following list which are more stable than the remaining two



- (1) $[\text{CoF}_6]^{3-}, [\text{CoI}_6]^{3-}$ (2) $[\text{CoI}_6]^{3-}, [\text{AgF}_2]^{-}$
 (3) $[\text{AgF}_2]^{-}, [\text{AgI}_2]^{-}$ (4) $[\text{CoF}_6]^{3-}, [\text{AgI}_2]^{-}$

77. Molecular formula of Geraniol is

- (1) $\text{C}_{10}\text{H}_{16}\text{O}$ (2) $\text{C}_{10}\text{H}_{18}\text{O}$ (3) $\text{C}_{10}\text{H}_{16}\text{O}_2$ (4) $\text{C}_{10}\text{H}_{14}\text{O}$

78. Acetaldehyde in the presence of few drops of H_2SO_4 at 0°C gives

- (1) aldol (2) paraldehyde (3) metaldehyde (4) crotonaldehyde

79. Molecular formula piperine is

- (1) $\text{C}_{17}\text{H}_{19}\text{NO}_3$ (2) $\text{C}_{17}\text{H}_{19}\text{NO}_2$ (3) $\text{C}_{17}\text{H}_{21}\text{NO}_3$ (4) None of these

80. The reagent that differentiates an aldose and a ketose is

- (1) Fehling solution (2) Tollen's reagent
 (3) Molish test (4) bromine water

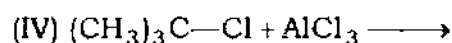
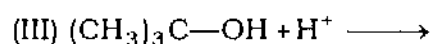
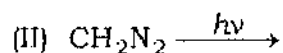
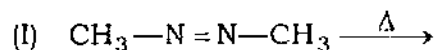
81. Bubbling of chlorine gas in boiling acetaldehyde gives

- (1) CH_3COCl (2) $\text{CH}_3\text{CH}_2\text{Cl}$
 (3) CCl_3CHO (4) $\text{ClCH}_2\text{CH}_2\text{Cl}$

82. The reaction of phenylacetylene with sodamide in liquid ammonia gives

- (1) styrene (2) 2,5-dihydrophenylacetylene
 (3) 1,4-dihydrophenylacetylene (4) sodium phenylacetylide

83. In the following reactions



the reaction intermediates formed will be

I	II	III	IV
(1) $\cdot\text{CH}_3$	$:\text{CH}_2$	$(\text{CH}_3)_3\text{C}^\cdot$	$(\text{CH}_3)_3\text{C}^-$
(2) $^-\text{CH}_3$	$:\text{CH}_2$	$(\text{CH}_3)_3\text{C}^+$	$(\text{CH}_3)_3\text{C}^-$
(3) $\cdot\text{CH}_3$	$:\text{CH}_2$	$(\text{CH}_3)_3\text{C}^+$	$(\text{CH}_3)_3\text{C}^+$
(4) CH_3	$\cdot\text{CH}_2$	$(\text{CH}_3)_3\text{C}^+$	$(\text{CH}_3)_3\text{C}^-$

84. Oxidation is associated with

- | | |
|--------------------------------|----------------------|
| (1) change in molecular weight | (2) gain in electron |
| (3) evolution of gas | (4) loss of electron |

85. Which one is the reversible reaction in the following?

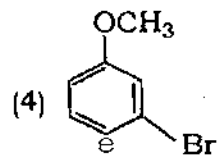
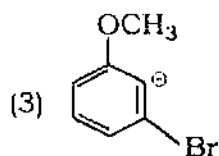
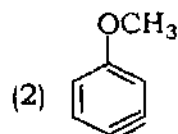
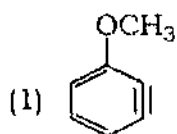
- | | |
|-----------------------------|---------------------------|
| (1) Sulfonation of benzene | (2) Nitration of benzene |
| (3) Halogenation of benzene | (4) Alkylation of benzene |

86. The electrophile in oleum in the sulfonation reaction of benzene is

- | | | | |
|-------------------|-------------------|---------------------|---|
| (1) SO_2 | (2) SO_3 | (3) SO_3^- | (4) $\overset{\cdot}{\text{S}}\text{O}_2$ |
|-------------------|-------------------|---------------------|---|

87. Vulcanisation of rubber is
- (1) cross-linking of hydrocarbon chain in crude rubber by sulphur
 - (2) heating of rubber to mould in the desired shape
 - (3) decreasing its tensile strength
 - (4) decreasing its elasticity
88. Polyester is condensation polymer of
- (1) phenol—formaldehyde
 - (2) terephthalic acid—ethylene glycol
 - (3) terephthalic acid—hexamethylene diamine
 - (4) urea—formaldehyde
89. Which one of the phenol derivatives is more steam volatile?
- (1) *o*-Nitrophenol
 - (2) *m*-Nitrophenol
 - (3) Hydroquinone
 - (4) *p*-Nitrophenol
90. The compound readily reacts with Lucas reagent at room temperature is
- (1) 2-methyl propanol
 - (2) 2-methyl propanoic acid
 - (3) 2-butanol
 - (4) 1-butanol
91. The compound which does not reduce Fehling's solution is
- (1) formic acid
 - (2) acetaldehyde
 - (3) benzaldehyde
 - (4) fructose
92. The acidity in decreasing order of different acids is
- (1) formic acid > chloroacetic acid > acetic acid > propanoic acid
 - (2) formic acid > propanoic acid > chloroacetic acid > acetic acid
 - (3) chloroacetic acid > acetic acid > formic acid > propanoic acid
 - (4) chloroacetic acid > formic acid > acetic acid > propanoic acid

93. Which one is an example of azo dye?
 (1) Malachite (2) Methyl orange (3) Indigo (4) Fluorescein
94. The reaction of benzaldehyde with ethyl α -bromopropionate in the presence of zinc is known as
 (1) Perkin reaction (2) Knoevenagel reaction
 (3) Claisen-Schmidt reaction (4) Reformatsky reaction
95. The reaction of acetaldehyde with concentrated NaOH gives
 (1) yellow resin (2) aldol
 (3) metaldehyde (4) paraldehyde
96. Anthracene on oxidation with chromic acid gives
 (1) anthranilic acid (2) anthraquinone
 (3) phthalic acid (4) terphthalic acid
97. The order of each of hydrogenations is
 (1) anthracene > naphthalene > benzene
 (2) benzene > anthracene > naphthalene
 (3) benzene > naphthalene > anthracene
 (4) naphthalene > anthracene > benzene
98. The intermediate in the reaction of *m*-bromoanisole with sodamide in liquid ammonia is

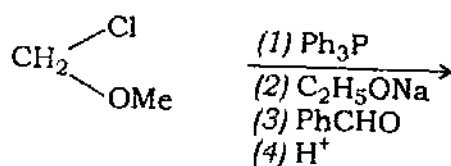


99. α -Naphthol couples with benzenediazonium salt at position
(1) 2 (2) 4 (3) 5 (4) 8
100. Conversion of aliphatic ketones to esters is known as
(1) Wolf rearrangement (2) Beckmann rearrangement
(3) Baeyer-Villiger oxidation (4) Clemmensen reduction
101. Isoquinoline on reduction with tin and hydrochloric acid gives
(1) octahydroisoquinoline (2) 1,2,3,4-dihydroisoquinoline
(3) 1,4-dihydroisoquinoline (4) 1,2-dihydroisoquinoline
102. The reaction of pyridine with acyl chloride in the cold gives
(1) 1-acylpyridinium chloride (2) 3-acylpyridine
(3) 4-acylpyridine (4) None of the above
103. Which one is least stable carbanion?
(1) $\text{C}_6\text{H}_5^-\text{CH}_2$ (2) $(\text{CH}_3)_3\text{C}^-$ (3) $^-\text{CCl}_3$ (4) $^-\text{CH}_3$
104. Which of the alkyl halides undergoes most readily for nucleophilic substitution reaction?
(1) $\text{CH}_3\text{CH}_2\text{Br}$ (2) $\text{CH}_3\text{CH}_2\text{F}$ (3) $\text{CH}_3\text{CH}_2\text{I}$ (4) $\text{CH}_3\text{CH}_2\text{Cl}$
105. The reaction of ethanolic KOH on 1,1-dichloropropane gives
(1) propanaldehyde (2) propyne
(3) propan-1,1-diol (4) propanone

109. A dilute solution of D(+)-glucose in presence of sodium hydroxide is converted into an almost optically inactive mixture which contains

- (1) D(+)-glucose, D(-)-arabinose and D(+)-mannose
- (2) D(+)-glucose and D(+)-mannose
- (3) D(+)-glucose, D(+)-mannose and D(-)-fructose
- (4) D(+)-mannose and D(-)-fructose

110. Predict the product of the following reaction

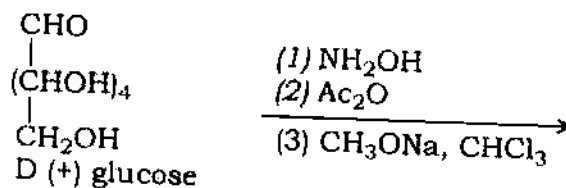


- (1) $\text{Ph}_3\text{P}=\text{CHOMe}$
- (2) $\text{Ph}-\text{CH}_2\text{CHO}$
- (3) $\text{Ph}-\text{CH}=\text{CHOMe}$
- (4) $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{OH}$

111. Which aldoses and ketoses form same osazone when treated with excess of phenylhydrazine?

- (1) D(+)-glucose, D(+)-mannose, D(+)-ribose
- (2) D(+)-glucose, D(+)-mannose, D(-)-fructose
- (3) D(+)-glucose, L(+)-arabinose
- (4) D(+)-glucose, D(-)-arabinose

112. Predict the product of the following reaction



- (1) D(-)-arabinose
- (2) Gluconic acid
- (3) Glucose penta acetate
- (4) D(+)-ribose

113. Which pair of the following pair of sugars is epimers?

- (1) D(+)-glucose, D(-)-fructose (2) D(+)-glucose, D(-)-arabinose
 (3) D(+)-glucose, D(+)-mannose (4) D(-)-fructose, D(+)-mannose

114. The orbital angular momentum for a 3p electron is

- (1) $\frac{h\sqrt{5}}{2\pi}$ (2) $\frac{h\sqrt{3}}{2\pi}$ (3) $\frac{h\sqrt{2}}{2\pi}$ (4) $\frac{h\sqrt{7}}{2\pi}$

115. Which one of the following atomic spectral transitions is forbidden?

- (1) $3d \rightarrow 4f$ (2) $2p \rightarrow 3s$ (3) $3p \rightarrow 3d$ (4) $4p \rightarrow 5f$

116. According to quantum mechanics, the energy levels of a free particle are

- (1) continuous (2) discrete and equally distant
 (3) discrete but not equally distant (4) Energy is always zero

117. The quantum number which is not derived from the solution of the Schrödinger wave equation for hydrogen atom is

- (1) azimuthal quantum number (2) principal quantum number
 (3) magnetic quantum number (4) spin quantum number

118. The d orbital which has a maximum probability density lying along two axes is known as

- (1) $d_{x^2 - y^2}$ (2) d_{z^2} (3) d_{xy} (4) d_{xz}

119. Which one of the following molecules has the highest bond energy?

- (1) F_2 (2) Cl_2 (3) Br_2 (4) I_2

120. The translational partition function has the unit of

- (1) V (2) 1/V (3) P (4) a number

121. The fundamental relation in Helmholtz free energy (A) and molecular partition function q is

- (1) $A = NkT \ln q$ (2) $A = -NkT \ln q$
 (3) $A = NkT \sum \exp\left(-\frac{\epsilon_i}{kT}\right)$ (4) $A = -NkT \sum \exp\left(-\frac{\epsilon_i}{kT}\right)$

122. For an ideal monatomic gas, the particle partition function q is

- (1) $\left(\frac{8\pi mkT}{h^2}\right)^{3/2} V$ (2) $\left(\frac{2\pi mkT}{h^2}\right)^{3/2} V$
 (3) $\left(\frac{h^2}{8\pi mkT}\right)^{3/2} V$ (4) $\left(\frac{h^2}{2\pi mkT}\right)^{3/2} V$

123. If ν is the fundamental frequency, μ is the reduced mass and k is the force constant, then for a harmonic oscillator

- (1) $k = \frac{1}{2\pi} \sqrt{\nu/\mu}$ (2) $\nu = 4\pi^2 k^2 \mu$ (3) $\nu = \frac{1}{2\pi} \sqrt{k/\mu}$ (4) $\nu = \frac{k}{\mu} \sqrt{1/2\pi}$

124. The Maxwell-Boltzmann distribution function of speed is

- (1) $f(v) = 4\pi \left(\frac{2\pi kT}{m}\right)^{3/2} v^2 \exp\left(-\frac{2kT}{mv^2}\right) dv$
 (2) $f(v) = 4\pi \left(\frac{m}{2\pi kT}\right)^{3/2} v^2 \exp\left(-\frac{mv^2}{2kT}\right) dv$
 (3) $f(v) = \frac{2}{\sqrt{\pi}} \left(\frac{2\pi kT}{m}\right)^{3/2} v^2 \exp\left(-\frac{mv^2}{2kT}\right) dv$
 (4) $f(v) = \frac{2}{\sqrt{\pi}} \left(\frac{m}{2\pi kT}\right)^{1/2} v^2 \exp\left(-\frac{2kT}{mv^2}\right) dv$

125. The difference between the magnitudes of the magnetic fields at which 'free' nuclei and molecular nuclei resonate is called

- (1) chemical shift (2) magnetic shift
(3) screening constant (4) anisotropy in g -value

126. When a transition between states of the same multiplicity occurs without emitting light, the process is called

- (1) fluorescence (2) internal conversion (IC)
(3) quenching (4) intersystem crossing (ISC)

127. Rotational spectra are observed in the

- (1) near infrared region (2) visible region
(3) far infrared region (4) UV region

128. Which one of the following is adopted as the primary reference electrode, assigned standard electrode potential equal to zero?

- (1) Hg/KCl soln. (aq) (2) Cu/CuSO₄ soln.
(3) Ag/AgCl/Cl (4) Pt/H₂(g, 1 atm.)/H⁺ (aq.) ($a_{H^+} = 1$)

129. The reverse of a photochemical reaction is called

- (1) chemiluminescence (2) phosphorescence
(3) fluorescence (4) photosensitization

130. A 5.0×10^{-3} M solution of K₂CrO₄ has optical density of 1.5 at 680 mμ using a 10 mm cell. Its extinction coefficient in the unit of L mol⁻¹ cm⁻¹ is

- (1) 0.75 (2) 300.00 (3) 7.50 (4) 30.00

131. For reversible isothermal expansion of a perfect (ideal) gas, which particular set of the following statements is correct?

- (1) $q > 0, w > 0, \Delta U = 0$ and $\Delta H = 0$ (2) $q > 0, w < 0, \Delta U = 0$ and $\Delta H > 0$
 (3) $q > 0, w < 0, \Delta U = 0$ and $\Delta H = 0$ (4) $q > 0, w < 0, \Delta U < 0$ and $\Delta H = 0$

132. "Fugacity of a gas in a mixture is equal to the product of its mole fraction in the mixture and its fugacity in the pure state at a total pressure of the mixture." This is in accordance with

- (1) Lewis-Randall rule
 (2) Konovalov's first law
 (3) Konovalov's second law
 (4) mathematical form of Duhem-Margules equation

133. Which one of the following is not true for real gases?

- (1) $\Delta G = nRT \ln \left(\frac{f_2}{f_1} \right)$ (2) $\lim_{P \rightarrow 0} \left(\frac{f}{P} \right) = 1$
 (3) $\gamma = \frac{a}{P}$ (4) $\Delta G = nRT \ln \left(\frac{P_2}{P_1} \right)$

134. In osmotic pressure method, molecular mass of polymers can be obtained from the intercept of the graph of

- (1) π vs. C (2) $\left(\frac{\pi}{C} \right)$ vs. C (3) $\frac{C}{\pi}$ vs. C (4) $\frac{\pi}{C}$ vs. \sqrt{C}

(π being osmotic pressure, C the mass concentration (mass/volume) of the polymer)

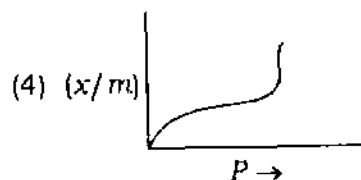
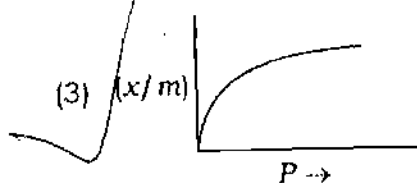
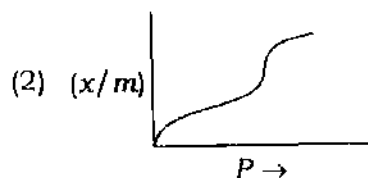
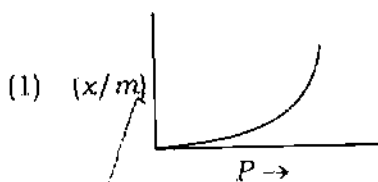
135. The half-life of a given reaction was halved as the initial concentration was doubled. What is the order of the reaction?

- (1) Zero order (2) Pseudo first order
 (3) Second order (4) Third order

136. Which of the following ions has the highest ionic mobility in aqueous solution?

- (1) Li^+ (2) Rb^+ (3) Na^+ (4) K^+

137. Which of the following isotherms was successfully explained by Langmuir's unimolecular layer theory?



138. The oscillator strength of a spectral transition has the units of

- (1) mol s m^{-2} (2) $\text{dm}^3 \text{ mol}^{-1} \text{ cm}^{-1} \text{ s}^{-1}$
 (3) cm^{-1} ~~(4) dimensionless quantity~~

139. According to Debye-Hückel theory of strong electrolytes, an ion while moving in a particular direction under the influence electric field experiences a drag due the presence of ionic atmosphere of excess oppositely charged ions around moving ion. This effect is known as

- (1) asymmetric effect (2) electrophoretic effect
 (3) Brownian effect (4) concentration effect

140. Which one of the following statements is wrong?

- (1) $^{14}_6\text{C}$ is a radioactive isotope of carbon
 (2) $^{60}_{27}\text{Co}$ is an unstable radio isotope of cobalt
 (3) Radioactive disintegration follows second-order kinetics
 (4) Superconducting materials are diamagnetic

141. The violet colour of $\text{Na}_{(1+\delta)}\text{Cl}$ crystal is due to
- (1) Frenkel defects (2) Schottky defect
(3) interstitials (4) F centres
142. The difference between the potential of the electrode when gas evolution is actually observed and the theoretical reversible potential value for the same reaction is called
- (1) concentration polarization (2) overvoltage
(3) Dorn effect (4) sedimentation potential
143. Sulfur can exist in
- (1) one phase (2) two phases (3) three phases (4) four phases
144. A first-order chemical reaction is 10% complete in 10 minutes. Its half-life is (given $\log 3 = 0.48$)
- (1) 50.50 minutes (2) 7.5 minutes (3) 95.6 minutes (4) 75.2 minutes
145. The half-life of a second-order chemical reaction $2A \rightarrow$ products whose initial concentration was 0.01 mol L^{-1} , was found to be 300 minutes. Its rate constant is
- (1) $0.36 \text{ mol L}^{-1} \text{ min}^{-1}$ (2) $3.6 \text{ mol L}^{-1} \text{ min}^{-1}$
(3) $0.63 \text{ mol L}^{-1} \text{ min}^{-1}$ (4) $0.036 \text{ mol L}^{-1} \text{ min}^{-1}$
146. For a reversible chemical reaction $A \xrightleftharpoons[k_{-1}]{k_1} X$ in which both the forward and reverse reactions are first order and the initial concentration of A is a_0 and the equilibrium concentration of X is x_e , the value of k_{-1} in terms of k_1 is given by
- (1) $k_1(a_0 - x_e)$ (2) $k_1 a/x_e$
(3) $k_1(a_0 - x_e)/x_e$ (4) $k_1 x_e/(a_0 - x_e)$

147. A consecutive chemical reaction, $A \xrightarrow{k_1} B \xrightarrow{k_2} C$ is first order at both the stages with rate constants as k_1 and k_2 . The time required to attain the maximum concentration of B is given by

- (1) $\frac{0.693}{(k_1 + k_2)}$ (2) $\frac{(\ln k_1 - \ln k_2)}{(k_1 - k_2)}$ (3) $\frac{(\ln k_1 + \ln k_2)}{(k_1 + k_2)}$ (4) $\frac{(k_1 + k_2)}{(k_1 - k_2)}$

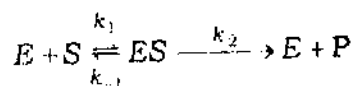
148. The energy of activation for the decomposition of NO_2 into NO and O_2 is negative which may be due to one of the following

- (1) Increase in entropy on decomposition of NO_2
 (2) Formation of stable intermediates
 (3) Formation of free radicals
 (4) Decrease in enthalpy on formation of NO and O_2

149. True activation energy of a unimolecular surface reaction is obtained by measuring the temperature dependence of rate constants at one of the following

- (1) Low pressures (2) Low temperatures
 (3) Constant volume (4) High pressures

150. The rate constants, k_1 , k_{-1} and k_2 for the enzyme catalysed reaction



are 0.1 , 0.01 and 0.05 s^{-1} respectively. The Michaelis constant for the reaction is

- (1) 0.6 (2) 1.6 (3) 0.066 (4) 2.25



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 मादा 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. रफ 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।