

Question Papers

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ExamCode: CHE_CHEMISTRY_022015

1. The symmetry number for methane CH_4 is:

- 1) 9
3) 10
2) 12
4) 8

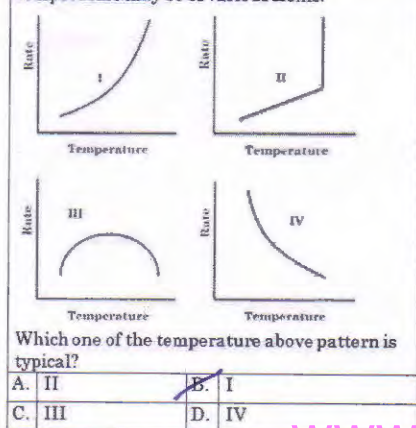
2. The number of degrees of freedom and the number of components for a system of sodium chloride solution in water containing undissolved salt, in equilibrium with vapour

- 1) 2 and 2
2) 1 and 1
3) 1 and 2
4) 0 and 2

3. For which reaction the unit of rate constant is sec^{-1} ?

- 1) Zero order
2) Second order
3) Third order
4) First order

4. Observed rates or rate constants as a function of temperature may be of various forms.



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5. Which one of the following is correctly matched?

- 1) Adsorption - Langmuir
2) Lindemann - Ionic strength
3) Inversion of sucrose - Gaseous unimolecular reaction
4) Debye - Huckel - H_2O , H^+

6. A zero order reaction is one whose rate is independent of-

- 1) Temperature of reaction
2) The concentration of the products
3) The concentration of the reactants
4) The material of the vessel in which the reaction is conducted

7. Match List - I correctly with List - II and select your answer using the codes given below

List - I	List - II
a) 1 \AA	1) X - rays
b) 2000 \AA	2) Ultraviolet
c) 5000 \AA	3) Visible
d) 10000 \AA	4) Infrared

	a	b	c	d
A.	1	2	3	4
B.	2	1	4	3
C.	2	1	3	4
D.	3	1	4	2

8. For the reaction, $I - CH_2 - COOH + CNS^- \rightarrow CH_2(CNS) - COOH + I^-$, a plot of $\log k/k_0$ against $\sqrt{\mu}$ should be-

- 1) Linear with a zero slope
2) Linear with a negative slope
3) Linear with a positive slope
4) Non-linear with changing slopes

9. Consider the following statement. I. Emission of radiation by an excited atom or molecule is called fluorescence. II. In phosphorescence, emission of light takes place much more slowly than in fluorescence. III. Chemiluminescence is a process in which light is emitted at ordinary temperatures as a result of chemical reaction. IV. In all these processes, light is emitted. Of these statements,

- 1) I alone is correct
2) I and II are correct
3) I, II, III are correct
4) All are correct

10. The rate of certain reaction doubles for every $10^\circ C$ rise in temperature. If the temperature of this reaction is increased by $60^\circ C$, the rate of the reaction increases by-

- 1) 20 times
2) 32 times
3) 64 times
4) 128 times

11. Pick out the correct statement about a catalyst.

- 1) It speeds up the rate of reaction by increasing the activation energy
2) It speeds up the reaction by decreasing the activation energy keeping the reaction mechanism the same
3) It speeds up the reaction by providing an alternate path of lower activation energy
4) It alters the position of equilibrium

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12. Decomposition of HI on gold surface is an example for _____ order reaction.

- 1) First
2) Second
3) Third
4) Zero

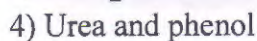
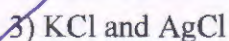
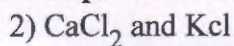
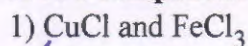
13. Match List - I correctly with List - II and select your answer using the codes given below.

List - I		List - II	
a) $n_1 d\bar{G}_1 + n_2 d\bar{G}_2 = 0$		1) Reaction Isotherm	
b) $\Delta G = \Delta G^\circ + RT \ln \frac{a_c \cdot a_p}{a_A \cdot a_B}$		2) Gibbs-Duhem equation	
c) $\frac{d \ln P}{dT} = \frac{\Delta H_r}{RT^2}$		3) Clapeyron equation	
d) $\frac{dP}{dT} = \frac{\Delta H}{T \Delta V}$		4) Clausius-clapeyron equation	
	a	b	c
A.	1	3	4
B.	2	1	4
C.	3	4	2
D.	1	2	3

14. Consider the following statements: I) $A + B \rightarrow C + D$; $\Delta G = \text{Negative}$ (Spontaneous) II) $A + B \rightarrow C + D$; $\Delta G = \text{Positive}$ (Non-spontaneous) III) $A + B \rightarrow C + D$; $\Delta G = \text{Zero}$; (Equilibrium) Choose the correct answer from the following:

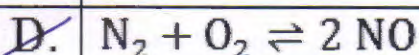
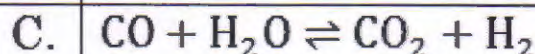
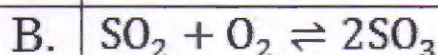
- 1) I alone is correct
2) I is correct, II is wrong
3) II and III are correct, I is wrong
4) I, II and III are correct

15. A two component condensed system belonging to the simple eutectic class is:



16.

Which one of the following is referred to as the Birkeland and Eyde process?



17. When HCl gas is passed through a saturated solution of NaCl, the solubility of NaCl-

1) Increases

☒ 2) Decreases

3) Does not change

4) NaCl is decomposed

18. In which one of the following cases, does the reaction go farthest to completion? (Where K is the equilibrium constant)

☒ 1) $K = 10^2$

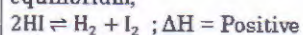
2) $K = 10$

3) $K = 10^{-2}$

4) $K = 1$

19.

Consider the following statements for the equilibrium,



I) Increase in temperature favours the formation of H_2 and I_2 .

II) A change in pressure has no influence on the equilibrium.

III) Introduction of H_2 favours the formation of HI

IV) The equilibrium constant is dimensionless.

Choose the correct answer from the following:

A. I, II and III true, IV is wrong

☒ B. All are correct

C. I alone is correct

D. All are false

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20.

Which of the following represents the correct equilibrium expression for the reaction?



A. $\frac{[CaSO_4 \cdot 3H_2O][H_2O]^2}{[CaSO_4 \cdot 5H_2O]}$

B. $\frac{[CaSO_4 \cdot 3H_2O]}{[CaSO_4 \cdot 5H_2O]}$

☒ C. $[H_2O]^2$

D. $[H_2O]$

21. According to chemical kinetic theory, a theory can occur-

- 1) If the reactants collide with the proper orientation ~~2) If the reactants possess sufficient energy of collision~~
~~3) If the reactants are able to form a correct transition state~~ 4) All of the above

22. The ionic radii of Zn^{2+} and S^{2-} are 0.074 nm and 0.184 nm respectively. Then Zn^{2+} ions should pack into-

- ~~1) Tetrahedral holes~~ 2) Octahedral holes
3) Cubic holes 4) Closest packed structure

23. The rotational constant B in cm^{-1} units is given by-

~~A.~~ $B = \frac{h}{8\pi^2 IC} \text{cm}^{-1}$

B. $B = \frac{h^2}{8\pi^2 I} \text{cm}^{-1}$

C. $B = \frac{h}{8\pi^2 I} \text{cm}^{-1}$

D. $B = \frac{h^2}{8\pi^2 IC}$

24. Nickel metal crystallises in a face-centered cubic unit cell. How many atoms of Ni would be present per unit cell?

- ~~1) 4~~ 2) 3
3) 2 4) 1

25. A metallic element crystallises into a lattice containing a sequence of layers of ABABAB....What percentage by volume of this lattice is empty in space?

- 1) 74 % ~~2) 26 %~~
3) 50 % 4) None of these

26. Which one of the following is incorrect in the case of metals and semiconductors?

- 1) Both conduct electric current 2) The electrical conductivity of metals is unaffected by impurities whereas that of semiconductors is increased by impurities
3) Metallic conduction decreases with increase in temperature; conduction of semiconductors increases with temperature ~~4) Semiconductors may be metals or non-metals~~

27. Which one of the following does not have the crystal lattice of the NaCl type?

- 1) NaI 2) KCl
3) RbI ~~4) CsCl~~

28.

When common salt is added to ice the equilibrium that exists is:

- | | |
|--|---|
| <input checked="" type="checkbox"/> A. | $\text{ice} \rightleftharpoons \text{salt} \rightleftharpoons \text{salt solution}$ |
| B. | $\text{ice} \rightleftharpoons \text{salt solution}$ |
| C. | $\text{ice} \rightleftharpoons \text{salt}$ |
| D. | None of these |

29. A crystal of sodium chloride which has sodium ions and chloride ions missing from the lattice points is said to exhibit-

- 1) Frenkel defect
2) Surface defect
3) Lattice defect
☒ 4) Schottky defect

30. The intermetallic compound LiAg crystallises in cubic lattice in which both lithium and silver have co-ordination number of eight. The crystal class is:

- 1) Simple cube
2) Body centered cube
3) Face centered cube
4) None of these

31. Apply Nernst equation to the following reaction.
 $\text{CO} + \text{Ni}^{2+} \rightleftharpoons \text{CO}^{2+} + \text{Ni}$, $E^0 = 0.03$ volt when the
 $[\text{Ni}^{2+}] = 1 \text{ M}$ and $[\text{CO}^{2+}] = 0.1 \text{ M}$, then E is equal to-

- | | |
|--|-----------|
| A. | 0.03 volt |
| <input checked="" type="checkbox"/> B. | 0.06 volt |
| C. | 0.09 volt |
| D. | 0.12 volt |

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32. Which one of the following is a chemical cell without transference?

- ☒ 1) $\text{H}_2 (\text{g}, P_{\text{H}_2}) \mid \text{HCl}(a_{\text{HCl}}), \text{AgCl}(\text{s}) \mid \text{Ag}$
 2) $\text{H}_2 (P_{\text{H}_2}=P_1) \mid \text{H}^+ \mid \text{H}_2 (P_{\text{H}_2}=P_2)$
 3) $\text{Zn} \mid \text{Zn}^{2+} \parallel \text{Cd}^{2+} \mid \text{Cd}$
 4) $\text{H}_2 (\text{g}, 1 \text{ atm}) \mid \text{H}^+ (a_1) \mid \text{H}^+ (a_2) \mid \text{H}_2 (\text{g}, 1 \text{ atm})$

33.	The emf (E_{H_2}) of the hydrogen electrode and the pH of a solution are related through the equation,
<input checked="" type="checkbox"/> A.	$E_{H_2} = \left(\frac{2.303 RT}{F} \right) \text{pH}$
B.	$\text{pH} = E_{H_2} \left(\frac{2.303 RT}{F} \right)$
C.	$E_{H_2} = \left(\frac{2.303 RT}{nF} \right) \text{pH}$
D.	$\text{pH} = \frac{2.303 RT}{nFE_{H_2}}$

34.	Which one of the following is correctly matched?
A.	$\Delta H = -nFT \left(\frac{\partial E}{\partial T} \right)_P$
<input checked="" type="checkbox"/> B.	$\Delta S = nF \left(\frac{\partial E}{\partial T} \right)_P$
C.	$\Delta G = -nFT \left(\frac{\partial E}{\partial T} \right)_P$
D.	$\Delta H = -nFT$

35. Consider the following statements. I. The conductance of all electrolytes increases with temperature. II. In dilute solutions, λ for strong electrolytes is linearly related to the square root of concentration. III. The degree of dissociation of any electrolyte is unity at infinite dilution. IV. Both specific and equivalent conductance's of a solution vary with concentration. Choose the correct answer from the following.

- ☒ 1) All statements are true
 2) I alone is correct
 3) I, II, III are true, IV is false
 4) IV alone is true

36. What is the degree of dissociation of an acid HA, if its $K_a = 1 \times 10^{-5}$ and the concentration is equal to $1 \times 10^{-2} \text{M}$?

- ☒ 1) 3.16×10^{-2}
 2) 3.16×10^{-3}
 3) 3.16×10^{-4}
 4) 3.16×10^{-5}

37. Fuel cells are desirable, because I. Their very high efficiency. II. The non-polluting nature of their operation. III. The most successful cell uses hydrogen as fuel. IV. The overall cell reaction is the combustion of hydrogen. Choose the best answer from the following.

- 1) I alone is correct
 2) I and II are correct
 3) III and IV are correct
☒ 4) I, II, III and IV are correct

38. The coating on iron by _____ is known as galvanization.

- 1) Cr
2) ~~Zn~~
3) Ni
4) Cd

39. A dilute aqueous solution of sodium sulphate is electrolysed using platinum electrodes. The products at the anode and the cathode are-

- ~~1) O₂, H₂~~
2) O₂, Na
3) S₂O₈²⁻, Na
4) S₂O₈²⁻, H₂

40. 96500 coulombs of electric current liberates from CuSO₄ solution.

- 1) 63.5 g of Cu
2) ~~31.75 g of Cu~~
3) 96500 g of Cu
4) 100 g of Cu

41. Match List - I correctly with List - II and select your answer using the codes given below.

List - I	List - II
a) Einstein	1) $h(v - v_0) = \frac{1}{2}mv^2$
b) Bohr	2) $mvr = n \frac{h}{2\pi}$
c) DeBroglie	3) $hc = E\lambda$
d) Heisenberg	4) $\Delta x \times \Delta P \approx h$

	a	b	c	d
A.	4	2	3	1
B.	1	2	3	4
C.	2	1	4	3
D.	3	4	1	2

42. The quantum yield for reaction $2\text{HI} \rightarrow \text{H}_2 + \text{I}_2$ is 2. The no. of photons absorbed in an experiment involving decomposition of 0.01 mole of HI is ($N = 6.02 \times 10^{23}$) are-

- ~~1) 3.01 x 10²¹~~
2) 30.1 x 10²¹
3) 0.301 x 10²¹
4) 301 x 10²¹

43. A covalent compound with high melting point is:

- 1) Sodium chloride
2) Bromine
~~3) Silicon di-oxide~~
4) Barium chloride

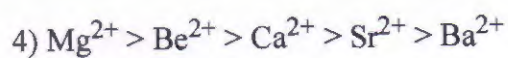
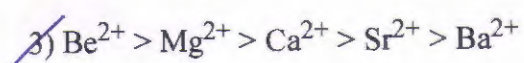
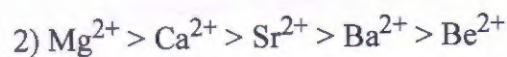
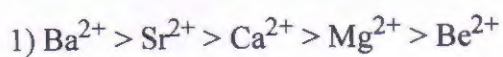
44. Half life period of 1st order reaction is 1 hour 40 mins. The value of the rate constant will be-

- 1) 0.693 min⁻¹
2) 0.0693 min⁻¹
~~3) 0.00693 min⁻¹~~
4) 69.3 min⁻¹

45. The bond order in O₂ molecule is:

- 1) 1
2) ~~2~~
3) 3
4) 4

46. Which one of the following places the ions in the order of decreasing hydration energy?



47. Consider the following statements: Assertion (A): The temperature needed to vapourise potassium chloride is greater than that required to vapourise carbon dioxide. Reason (R): While both consists of molecules, those of potassium chloride are attracted to their neighbours much more strongly than are those of carbon-di-oxide. Now select your answer according to the coding scheme given below:

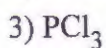
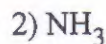
1) Both (A) and (R) are true, (R) is the correct explanation of (A)

2) Both (A) and (R) are true, (R) is not the correct explanation of (A)

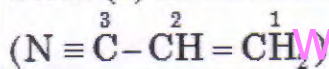
☒ 3) (A) is true, but (R) is false

4) (A) is false and (R) is true

48. Which one of the following does not have the same point group as CHCl_3 ?



49. The bond between carbon atom(1) and carbon atom (2) in the following compound,



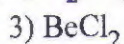
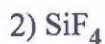
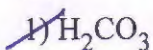
☒ A. sp^2 and sp^2

B. sp^3 and sp

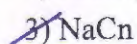
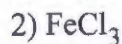
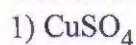
C. sp and sp^2

D. sp and sp

50. Among the following compounds, the one that is polar and has the central atom with sp^2 hybridisation is:



51. The solution of a certain salt in water is alkaline. The salt is likely to be-



52. Match List I correctly with List II and select your answer using the codes given below.

List - I	List - II
a) NH_2^-	1) Lewis acid
b) SnCl_4	2) Bronsted acid
c) HSO_3^-	3) Arrhenius base
d) NaOH	4) Conjugate base

	a	b	c	d
A.	1	2	3	4
B.	4	1	2	3
C.	3	2	1	4
D.	2	1	3	4

53. Consider the following statements. I. Silver chloride is more soluble in concentrated solution of sodium chloride than in pure water. II. Neutralisation always produces a solution of $\text{pH}=7$. III. Oswald's dilution law is applicable to all electrolytes. IV. The solubility of aluminium hydroxide is 's' g mol dm^{-3} . Its solubility product is $27s^4$. Which one of the following is the correct answer?

- 1) I, II, III, IV are true
 2) ~~I, II, III are false, IV is true~~
 3) I, II are false, III, IV are true
 4) I, II, III, IV are false

54. The strongest acid that may exist in anhydrous acetic acid is:

- ~~1) $\text{CH}_3\text{COOH}_2^+$~~
 2) CH_3COOH
 3) H^+
 4) H_3O^+

55. In which one of the following the compounds are arranged in the increasing order of oxidation number of nitrogen?

- 1) Hydrazine, ammonia, nitrous oxide, nitric oxide
 2) ~~Ammonia, hydrazine, nitrous oxide, nitric oxide~~
 3) Nitrous oxide, ammonia, hydrazine, nitric oxide
 4) Nitric oxide, nitrous oxide, hydrazine, ammonia

56. Perchloric acid is one of the strongest acids. This is because-

- 1) Four oxygen atoms are present
 2) Only one hydrogen is present
 3) ~~The perchlorate anion is very stable~~
 4) The chlorine atom is in the highest oxidation state

57. What volume of 0.02 M potassium permanganate solution would be needed to react completely with 20 cc of 0.01 M stannous chloride solution?

- ~~1) 4 CC~~
 2) 8 CC
 3) 12 CC
 4) 16 CC

58. Calcium metal is obtained by the electrolysis of fused CaCl_2 in the presence of NaCl . The role of NaCl is to-

- 1) Increase the chloride concentration
 2) Increase the conductivity of the fused mass
 3) ~~Lower the melting point of CaCl_2 and thus the operating temperature of the cell~~
 4) Produce the complex $\text{Na}_2[\text{CaCl}_4]$ which renders low consumption of electricity

59. When CH_3COONa is added to aqueous CH_3COOH solution the pH value?

- 1) Decreases
 2) ~~Increases~~
 3) Remains constant
 4) Is zero

60. The concentration of Ag^+ in a given saturated solution of AgCl at 25°C is 1.06×10^{-5} g ion per litre. The solubility product of AgCl is:

- 1) 0.353×10^{-10}
 2) 0.530×10^{-10}
 3) ~~1.12×10^{-10}~~
 4) 2.12×10^{-10}

61. Ion pairing in solution-

- 1) Does not influence conductance
 2) Increases the conductance
 3) ~~Decreases the conductance~~
 4) Increases the conductance twofold

62. The bonding in graphite is best represented as-

- 1) Ionic within layers, covalent between layers
 2) ~~Covalent within layers, dispersion forces between layers~~
 3) Ionic within layers, dispersion forces between layers
 4) Covalent within layers, ionic between layers

63. Match List I correctly with List II and select your answer using the codes given below.

List - I	List - II
a) BeCl_2	1) Soluble in organic solvents
b) B_2H_6	2) Three centre electron pair bond
c) LiBH_4	3) Ionic
d) SiO_2	4) Covalent
	a b c d
A.	1 2 3 4
B.	2 3 1 4
C.	2 1 3 4
D.	4 2 1 3

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64. Which one of the following would yield methane on hydrolysis?

- 1) ~~Al_4C_3~~
 2) CaC_2
 3) Li_4C
 4) SiC

65. When the e.m.f of a cell 'E' values are measured at various temperatures T, for 'n' electrons transfer in the balanced cell reactions, then the change in entropy ' ΔS ' is given as:

A.	$nF + \left(\frac{\partial E}{\partial T}\right)_p$
B.	$\frac{nF}{\left(\frac{\partial E}{\partial T}\right)_p}$
C.	$nF \left(\frac{\partial E}{\partial T}\right)_p$
D.	$\frac{1}{nF} \left(\frac{\partial E}{\partial T}\right)_p$

66. Which two of the following statements about HOCl and HClO₄ are correct? I) Both are oxidising agents II) Both are acids III) HOCl is an oxidising agent, but not HClO₄. IV) HClO₄ is an oxidising agent, but not HOCl

~~1) I and II~~

3) III and IV

2) II and III

4) I and IV

67. Pick from the following a compound or an ion that is tetrahedral.

1) ICl₄⁻

2) [Cu(NH₃)₄]²⁺

~~3) XeO₄~~

4) BrF₄⁻

68. Which one of the following order of acidity is correct?

1) HOI > HOCl > HOBr > HCl

2) HOI > HOCl > HCl > HOBr

3) HOI > HOBr ≈ HOCl > HCl

~~4) HCl > HOCl > HOBr > HOI~~

69. The compound which gives off oxygen on moderate heating is:

1) Cupric oxide

~~2) Mercuric oxide~~

3) Zinc oxide

4) Aluminium oxide

70. The material used in solar cells is:

1) Cs

2) Ga

~~3) Si~~

4) Ti

71. Identify the correct formula from the following nomenclature, Dichlorotetrammine platinum (IV) chloride.

~~1) [Pt(NH₃)₄ Cl₂] Cl₂~~

2) [Pt(NH₃)₄ Cl₂] Cl₃

3) [Pt(NH₃)₄ Cl₂] Cl₄

4) [Pt(NH₃)Cl₂] Cl

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72. The central metal ion in one of the following coordinate complexes is NOT in the +2 oxidation state. Identify the complex

1) [Zn(NH₃)₄] Cl₂

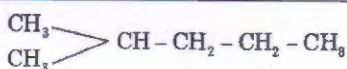
2) Na₄[Fe(CN)₆]

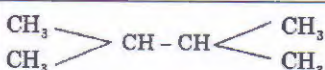
~~3) [Co(NH₃)₆] Cl₃~~

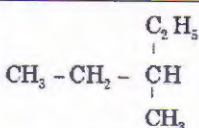
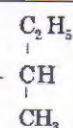
4) [Fe(CN)NO] SO₄

73. From among the 4 constitutional isomers of C₆H₁₄, which one of the following is named as a derivative of butane in the IUPAC system?

A. CH₃ CH₂ CH₂ CH₂ CH₂ CH₃

B.  CH₃ > CH - CH₂ - CH₂ - CH₃

~~C.  CH₃ > CH - CH < CH₃~~

D.  CH₃ - CH₂ - 

74. Which one of the following will give two isomeric alkenes on treatment with strong bases?

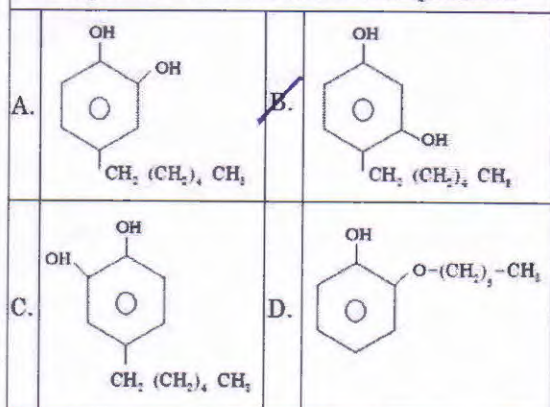
1) 1 - chloropentane

3) 3 - chloropentane

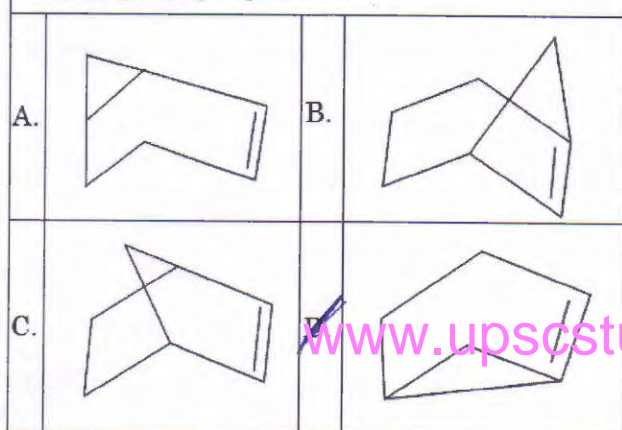
~~2) 2 - chloropentane~~

4) 1 - chloro- 2, 2 - dimethyl propane

75. 4 - n - Hexylresorcinol is used in certain antiseptics. The structure of the compound is:

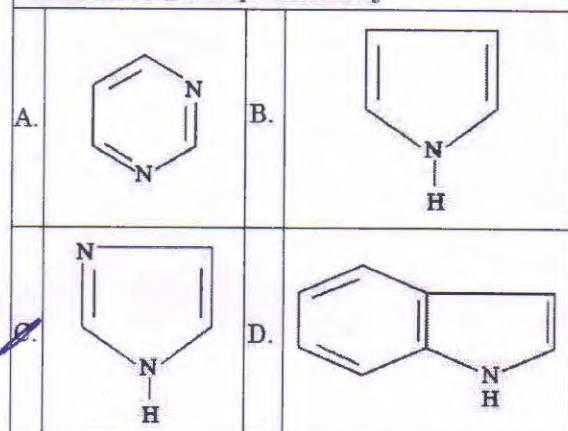


76. Bicyclo [2, 2, 1] heptane is:



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77. Imidazole is best represented by -



78.	Consider the reaction $2A + B \rightarrow C + D$. If the concentration of the reactants are increased by three times, the rate of the reaction will increase by -
A.	9 times
B.	81 times
C.	64 times
D.	27 times

79. The IUPAC name of $CH_3 - CH = CH - C \equiv CH$ is:

- 1) Pent - 2 - en - 4 - yne
 2) ~~Pent - 3 - en - 1 - yne~~
 3) Pent - 3 - yne - 1 - en
 4) Pent - 2 - yne - 1 - en

80. The compound with an isopropyl group is:

- 1) 2, 2, 3, 3 - Tetra methyl pentane
 2) 2, 2 - Dimethyl pentane
 3) 2, 2, 3 - Tri methyl pentane
 4) ~~2 - Methyl pentane~~

81. How many mono chloro derivatives are possible for methyl cyclo hexane?

- 1) 7
 2) 6
~~3) 5~~
 4) 2

82. Which concentration plot is linear for a first order equation (A is the reactant)?

- 1) [A] versus time
 2) $[A]^{1/2}$ versus time
~~3) $\ln[A]$ versus time~~
 4) $[A]^2$ versus time

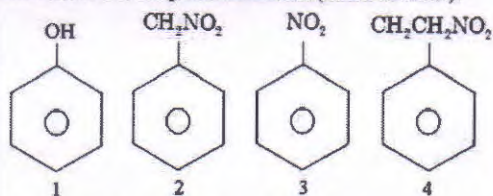
83.	X is an alkene. It is subjected to the following reactions. $X \xrightarrow{B_2H_3, \text{ether}} Y \xrightarrow{H_2O_2, NaOH} 3\text{-methyl-2-butanol. Therefore is X-}$
A.	$CH_2 = CH - CH_2 - CH_2 - CH_3$
B.	$\begin{array}{c} CH_3 \\ CH_3 \end{array} > C = CH - CH_3$
C.	$CH_3 - CH = CH - CH_2 - CH_3$
D.	$\begin{array}{c} CH_3 \\ CH_3 \end{array} > CH - CH = CH_2$

84. When 1-butane undergoes ozonolysis, it gives-

- 1) Acetaldehyde only
 2) Formaldehyde only
~~3) Propionaldehyde and formaldehyde~~
 4) Acetaldehyde and acetone

85.

The following compounds are subjected to aromatic electrophilic reaction (substitution).

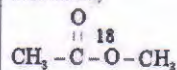


The correct order of reactivity is:

- | | |
|--|---------------|
| A. | 1 > 2 > 3 > 4 |
| <input checked="" type="checkbox"/> B. | 1 > 4 > 2 > 3 |
| C. | 1 > 3 > 4 > 2 |
| D. | 1 > 2 > 4 > 3 |

86.

The ester,



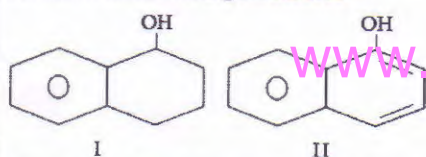
is hydrolysed with aqueous H_2SO_4

At the end of the reaction ^{18}O is incorporated into one of the following. Which one is this?

- | | |
|--|---|
| A. | $\text{CH}_3 - \overset{\overset{\text{O}}{\parallel}}{\text{C}} - \text{OH}$ |
| <input checked="" type="checkbox"/> B. | $\text{CH}_3 - ^{18}\text{OH}$ |
| C. | $\text{CH}_3 - \overset{\overset{^{18}\text{O}}{\parallel}}{\text{C}} - \text{OCH}_3$ |
| D. | H_2O^{18} |

87.

Consider the following structures -



Which one of the following reagents would you employ to distinguish I from II.

- | | |
|--|----------------------------------|
| A. | Aqueous NaHCO_3 |
| B. | $\text{H}^+, \text{H}_2\text{O}$ |
| C. | Na |
| <input checked="" type="checkbox"/> D. | Aqueous NaOH |

88. How many ESR signals are obtained for NH_3 radicals?

- | | |
|--|------|
| <input checked="" type="checkbox"/> 1) 6 | 2) 5 |
| 3) 4 | 4) 3 |

89. Arrange the following compounds in the order of increasing acidity (starting with low acidity).

- | | |
|---|---|
| 1) p-cl phenol, p-o Me phenol p- NO_2 phenol, phenol | 2) phenol, p- NO_2 phenol, p- OMe_3 phenol, p-Cl phenol |
| <input checked="" type="checkbox"/> 3) p-oMe phenol, phenol, p-Cl phenol, p- NO_2 phenol | 4) p- NO_2 phenol, p-Cl phenol, phenol p-oMe phenol |

90. Which one of the following is the strongest organic base?

- 1) Aniline
2) Tri methyl amine
3) Pyridine
4) Guanidine

91. How many NMR signals are obtained for propanal?

- 1) 4
2) 3
3) 2
4) 1

92. Match List I correctly with List II and select your answer using the codes given below..

List - I	List - II
a) $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOC}_2\text{H}_5$	1) Benzoin condensation
b) $\text{C}_6\text{H}_5 - \text{CHO} + \text{alc KCN}$	2) Perkin reaction
c) $\text{C}_6\text{H}_5\text{CHO} + (\text{CH}_3\text{CO})_2\text{O} + \text{CH}_3\text{COONa}$	3) Aldol condensation
d) $\text{C}_6\text{H}_5\text{CHO} + \text{CH}_3\text{CHO} + \text{NaOH}$	4) Claisen condensation

	a	b	c	d
A.	3	2	1	4
B.	4	1	2	3
C.	2	4	1	3
D.	1	3	4	2

93. Which of the nuclei is NMR active?

- 1) ^{16}O
2) ^{12}C
3) ^{13}C
4) ^{18}O

94. Which of the following molecule will have higher vibrational frequency?

- 1) HI
2) HCl
3) HBr
4) HF

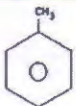
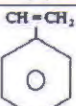
95. It is proposed to effect the following conversion, $\text{CH}_2 = \text{CH} - \text{CO} - \text{CH}_3 \rightarrow \text{CH}_2 = \text{CH} - \text{CH}(\text{OH}) - \text{CH}_3$
Which one of the following reagents will exactly achieve this?

- 1) LiAlH_4
2) NaBH_4
3) H_2 , Pt
4) H_2 , Lindar catalyst

96. Chichibabin reaction is an example of-

- 1) Radical substitution
2) Electrophilic substitution
3) Nucleophilic substitution
4) Condensation

97. Consider the bromination of the following compounds with N-bromosuccinimide in CCl_4 solvent.

$\text{CH}_2 = \text{CH} - \text{CH}_3$ (I)	 (II)
$\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$ (III)	 (IV)

Bromine substitution is possible in-

A. I only	B. I and II
C. III and IV	D. IV only

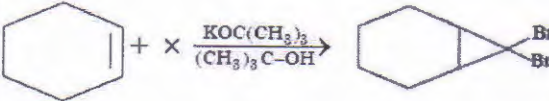
98. The following reaction,

$$\text{C}_6\text{H}_5 - \text{CO} - \text{CHO} \xrightarrow{\text{OH}^-} \text{C}_6\text{H}_5 \text{CH}(\text{OH})\text{COO}^- \text{Na}^+$$

is an example of-

A.	Perkin reaction
B.	Favorski reaction
C.	Aldol condensation
<input checked="" type="checkbox"/> D.	Cannizaro reaction

99. In the reaction,



X is:

A.	Br_2
B.	Br_3^-
<input checked="" type="checkbox"/> C.	CHBr_3
D.	NBS

100. Which one of the following is Baeyer-Villiger oxidation?

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A.	$\text{C}_6\text{H}_5 - \text{CO} - \text{CH}_3 \xrightarrow{\text{LiAlH}_4} \text{C}_6\text{H}_5 \text{CHOH} - \text{CH}_3$
<input checked="" type="checkbox"/> B.	$\text{C}_6\text{H}_5 - \text{CO} - \text{CH}_3 \xrightarrow{\text{C}_6\text{H}_5\text{CO}_3\text{H}} \text{C}_6\text{H}_5 \text{COO} \text{CH}_3$
C.	$\text{C}_6\text{H}_5 - \text{CH}(\text{OH}) - \text{CH}_3 \xrightarrow{\text{K}_2\text{Cr}_2\text{O}_7, \text{H}^+} \text{C}_6\text{H}_5 - \text{CO} - \text{CH}_3$
D.	$\text{C}_6\text{H}_5 - \text{CH}_2 - \text{CH}_3 \xrightarrow{\text{SeO}_2} \text{C}_6\text{H}_5 - \text{CO} - \text{CH}_3$

101. An increasing order(lowest first) for the values of e/m for electron(e), proton(p), neutron(n), and α particle is:

- 1) e, p, n, α
 3) n, p, α , e

2) n, p, e, α

☒ 4) n, α , p, e

102.

The ratio of the energy of a photon of 2000 \AA wavelength radiation to that of 4000 \AA

A.	$\frac{1}{4}$
B.	$\frac{1}{2}$
<input checked="" type="radio"/> C.	2
D.	4

103. Which one of the following relates photons to both wave and particle properties?

1) Diffraction

2) $E = h\nu$ ☒ 3) $E = mc^2$

4) Interference

104. Match List – I correctly with List – II and select your answer using the codes given below.

List – I (Principal quantum number)	List – II (Number of nodes)
a) 1	1) zero
b) 3	2) three
c) 4	3) two
d) 2	4) one

	a	b	c	d
<input checked="" type="radio"/> A.	1	3	2	4
B.	4	2	3	1
C.	2	3	4	1
D.	3	2	1	4

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105. To which neutral atom does the electronic configuration belong to? $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

☒ 1) Cr

2) Zn

3) Fe

4) Cu

106. The $\bar{\nu}$ (wave number) of the third line in the Paschen series of hydrogen atom is given by-

A.	$R_H \left(\frac{1}{1} - \frac{1}{2} \right)$
B.	$R_H \left(\frac{1}{4} - \frac{1}{16} \right)$
<input checked="" type="radio"/> C.	$R_H \left(\frac{1}{9} - \frac{1}{36} \right)$
D.	$R_H \left(\frac{1}{25} - \frac{1}{49} \right)$

107.

Which one of the following represents an impossible arrangement?

	n	l	m	s
A.	3	2	-2	$\frac{1}{2}$
B.	4	0	0	$\frac{1}{2}$
<input checked="" type="checkbox"/> C.	3	2	-3	$\frac{1}{2}$
D.	5	3	0	$\frac{1}{2}$

108. In a particle in a one dimensional situation, the energy gap between the levels $(n + 1)$ and n is: (where E_0 refers to the ground state energy)

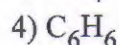
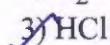
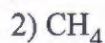
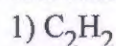
1) $(n+1) E_0$

☒ 2) $(2n+1) E_0$

3) $(n+1)^2 E_0$

4) $(2n+1)^2 E_0$

109. Rotational spectra is given by which of the molecule?



110. Hydrolysis of sucrose in presence of mineral acid is an example for -

1) Zero order

2) Pseudo-first order

☒ 3) First order

4) Second order

111. The quantity of electrical energy X by the generator, plus any friction less losses, is exactly equal to the quantity of mechanical energy Y by the turbine. Consider the above statement and choose the correct answer for the following

☒ 1) $X = \text{produced}; Y = \text{lost}$ 2) $X = \text{lost}; Y = \text{produced}$ 3) $X = \text{gained}; Y = \text{lost}$ 4) $X = \text{lost}; Y = \text{gained}$

112. Consider the following statement: In thermodynamics work is defined as any quantity that flows across the boundary of a system during a change in its state and is completely convertible into lifting of a weight in the surroundings. Which one of the following statements is then incorrect?

1) Work appears only during a change

☒ 2) Work appears everywhere in the system

3) Work is manifested by an effect in the surroundings

4) Work is positive if weight is lifted; it is negative if weight is lowered

113. In a certain reaction, the heat content of the products is more than that of the reactants. This is an example of-

1) Irreversible and endothermic

2) Reversible and exothermic

☒ 3) Endothermic

4) Exothermic

114. Which one of the following statements is the correct explanation for the fact C_p of a gas is always greater than C_v ?

- 1) At constant pressure the gas does pressure volume work on heating
 2) At constant pressure, average distances between gas molecules do not change on heating
 3) At constant pressure, the gas does not do any pressure-volume work on heating
 4) At constant volume, the gas does pressure volume work on heating

115. Which one of the following statements is the best?

- 1) The entropy of a substance is zero at absolute zero of temperature
 2) The entropy of a substance at absolute zero depends upon the physical state of the substance
 3) The entropy of a substance at absolute zero depends upon the physical and chemical states
 4) The entropy of a substance at absolute zero depends only upon the chemical state

116. Consider the following expressions

I) $\left(\frac{\partial A}{\partial T}\right)_V = -S$ II) $\left(\frac{\partial A}{\partial V}\right)_T = -P$

III) $\left(\frac{\partial G}{\partial T}\right)_P = -S$ IV) $\left(\frac{\partial G}{\partial P}\right)_T = V$

Which one of the following answers is correct?

- | | |
|----|--|
| A. | I, II and IV are correct; III is false |
| B. | I, III and IV are correct; II is false |
| C. | II, III, IV are correct; I is false |
| D. | I, II, III are correct; IV is false |

117. Which of the following is least ionic?

- 1) AgCl
 2) KCl
 3) BaCl₂
 4) KNO₃

118. Inversion temperature of a gas is that temperature-

- 1) Below which a gas has to be cooled before it can show Joule-Thomson effect
 2) At which on application of pressure, a gas is completely converted into liquid without having to be in equilibrium
 3) Above which no amount of pressure can liquify a gas
 4) At which the distinction between liquid and gas disappear

119. Under the same conditions, how many ml of 1M KOH and 0.5 M H₂SO₄ solutions respectively, when mixed to form a total volume of 100 ml, produces the highest rise in temperature?

- 1) 67, 33
 2) 33, 67
 3) 40, 60
 4) 50, 50

120. Consider the following reactions: $S + O_2 \rightarrow SO_2 + 2x \text{ k.cal}$ $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3 + y \text{ k.cal}$ Find out the heat of formation of SO_3

1) $2x - y$

3) $x + y$

2) $2x + y$

4) $y - 2x$

121. Non-classical carbonation is stabilized by-

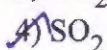
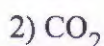
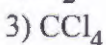
1) Carbon - carbon bond - π - electron

3) Hybridisation with unshared pair of electrons

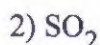
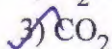
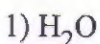
2) Carbon - carbon - σ - bond delocalisation

4) Generation of intermediates

122. Which one of the following is microwave active?



123. Identify the one for which IR active vibrations are Raman inactive and vice versa?



124. Which one of the following nucleus is NMR inactive?



125. The IUPAC name of $(CH_3)_3CCH=CH_2$ is:

1) 3, 3 - Dimethyl - 1 - butene

3) 2, 2 - Dimethyl - 3 - butene

2) 3, 3 - Dimethyl - 2 - butene

4) 2, 2 - Dimethyl - 4 - butene

126. In acetophenone, which one of the following electronic transitions are possible?

1) $\sigma - \sigma^*$ only

3) $n - \pi^*$; $n - \sigma^*$; $\sigma - \sigma^*$; $\pi - \pi^*$

2) $\sigma - \sigma^*$; $\pi - \pi^*$ only

4) $n - \pi^*$; $\sigma - \sigma^*$; $\pi - \pi^*$

127. Which one of the following statements about mass spectroscopy is incorrect?

1) Pentatonic acid shows a strong McLafferty rearrangement peak

3) In phenol, molecular ion peak itself is the base peak

2) Methyl bromide gives two very intense peaks at $m/e = 94$ and 96

4) The molecular ion peak of 1-butanol is absent

128. How many carbon magnetic resonance signals would be there in the proton-decoupled spectrum of secondary butyl bromide?

1) 1

3) 4

2) 3

4) 2

129. The IUPAC name of $[CO(en)_2 Cl(NO_2)]^+$

1) Chloronitrobis (ethylene diamine) Cobalt (III) ion

2) Chloronitrobis (ethylene diamine) Cobalt (II) ion

3) Chloronitritobis (ethylene diamine) Cobalt (II) ion

4) Chloronitrobis (ethylene diamine) Cobalt (IV) ion

130. Match List – I correctly with List – II and answer using codes given below:

List – I	List – II
a) 100 – 200 nm	1) NMR
b) $(\text{CH}_3)_4\text{Si}$	2) Vacuum UV
c) ESR	3) Microwave
d) CO_2	4) Raman

	a	b	c	d
A.	1	2	3	4
B.	4	3	2	1
<input checked="" type="radio"/> C.	2	1	3	4
D.	3	2	1	4

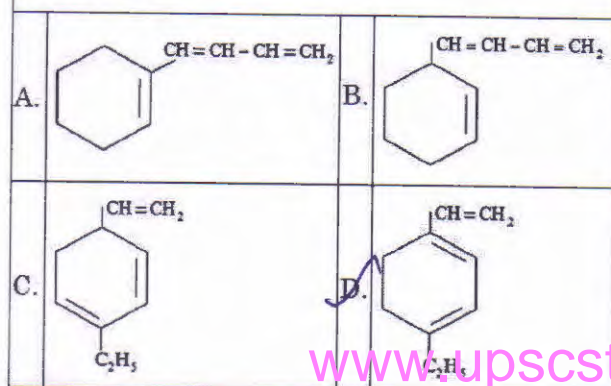
131. The unit of molar absorptivity(ϵ) is:

1) $\text{mole lit}^{-1} \text{cm}^{-1}$
☒ 2) $\text{lit mole}^{-1} \text{cm}^{-1}$

2) $\text{lit}^{-1} \text{mole cm}$

4) $\text{mole lit}^{-1} \text{cm}$

132. Which one of the following is expected to give greatest λ_{max} ?



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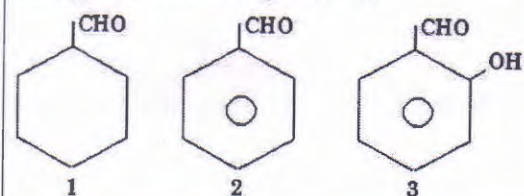
133. The change in entropy of an electrochemical cell with the temperature coefficient of the e.m.f as $0.0001 \text{ V deg}^{-1}$ for one electron transfer in the balanced cell reaction will be given as:

1) 96500 eu
☒ 2) 96.500 eu

2) 9.65 eu

4) $9.65 \times 10^{-5} \text{ eu}$

134. Predict the frequency order of the carbonyl IR absorption in the aldehydes 1 – 3.



- A. $3 > 2 > 1$
☒ B. $1 > 2 > 3$
 C. $2 > 1 > 3$
 D. $3 > 1 > 2$

135. The least δ (delta) chemical shift values in 60 MHz NMR is given by

A.	$\begin{array}{c} \text{H} \\ \\ -\text{C}-\text{R} \\ \\ \text{H} \end{array}$
B.	$-\text{C}\equiv\text{C}-\text{H}$
C.	$\text{Ar}-\text{H}$
D.	$\begin{array}{c} \\ -\text{C}-\text{Cl} \\ \\ \text{H} \end{array}$

136. Give a structure consistent with the following set of NMR data Molecular formula, $\text{C}_4\text{H}_9\text{Br}$ doublet, $\delta 1.04$, 6H multiplet, $\delta 1.95$, 1H doublet, $\delta 3.33$, 2H The structure (or compound) is:

- 1) n - butyl bromide
3) t - butyl bromide

- 2) Isobutyl bromide
4) Sec - butyl bromide

137. In mass spectrometry, meta stable peaks from-

1) Ions which decompose in the field-free region after they are accelerated out of the ion source but before entering analyser

2) Ions which decompose in the field-free region before they are accelerated

3) Ions which decompose in the field-free region at the time of acceleration

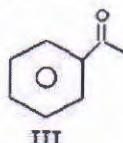
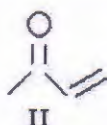
4) Ions which decompose in the ion source itself

138. Which velocity states of copper and silver will show a strong ESR signal?

- 1) Cu(I) and Ag(I)
3) Cu(I) and Ag(II)

- 2) Cu(II) and Ag(II)
4) Cu(II) and Ag(I)

139. Consider the following organic compounds.



The order of carbonyl IR frequencies is:

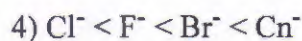
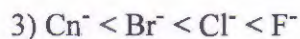
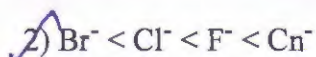
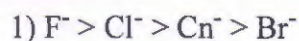
- A. $\text{I} > \text{II} > \text{III}$
B. $\text{III} > \text{II} > \text{I}$
C. $\text{II} > \text{I} > \text{III}$
D. $\text{I} > \text{III} > \text{II}$

140. Which one of the following spectroscopic techniques would be the best to distinguish $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$ and $\text{C}_6\text{H}_5\text{CONH}_2$?

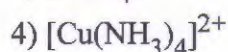
- 1) Electronic spectrum
3) Mass spectroscopy

- 2) ESR
4) Infrared spectroscopy

141. The common ligands in the order of the magnitude of the crystal field splitting they induce in any metal ion is:



142. Which one of the following is a diamagnetic complex?

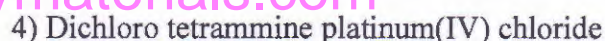
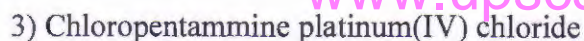
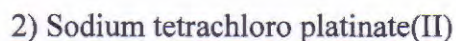


143. Match List – I correctly with List – II and answer using codes given below.

List – I	List – II (Geometry)
a) Nickel carbonyl	1) Trigonal bipyramid
b) $Fe(CO)_5$	2) Planar
c) Potassium hexacyano ferrate (II)	3) Octahedral
d) Tetrammine copper(II) sulphate	4) Tetrahedral

	a	b	c	d
A.	1	3	4	2
B.	4	1	3	2
C.	2	3	1	4
D.	3	2	4	1

144. 100% of chlorine can be precipitated by $AgNO_3$ as $AgCl$, from the complex-



145. Match List – I correctly with List – II and answer using codes given below.

List – I	List – II
a) Nitrate	1) Neutral monodentate
b) Sulphate	2) Mononegative bidentate
c) Glycinate	3) Mononegative monodentate
d) Pyridine	4) Di-negative monodentate

	a	b	c	d
A.	1	4	3	2
B.	4	2	1	3
C.	3	4	2	1
D.	2	3	1	4

146. Consider the following complexes I) $\text{Ni}(\text{CO})_4$ II) $[\text{NiCl}_4]^{2-}$ III) $[\text{Ni}(\text{CN})_4]^{2-}$ Choose the correct statement from the following:

- ☒ 1) I and III are diamagnetic; II is paramagnetic
2) II and III are diamagnetic; I is paramagnetic
3) I and II are diamagnetic; III is paramagnetic
4) I is diamagnetic, II and III are paramagnetic

147. Amongst the following ions which one has the highest paramagnetism?

- 1) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$
2) ☒ $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
3) $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$
4) $[\text{Zn}(\text{H}_2\text{O})_4]^{2+}$

148. Which one of the following will NOT exhibit stereoisomerism?

- 1) Dichlorotetrammine Cobalt (III) chloride
2) Trioxalato chromate (VI) chloride
3) Dichlorodiammine Platinum (II) chloride
4) ☒ Tetrammine Zinc (II) sulphate

149. The complex salt having the molecular formula, $[\text{Co}(\text{NO}_2)(\text{SCN})(\text{en})_2]\text{Br}$ exhibits

- 1) Hydrate isomerism
2) ☒ Linkage isomerism
3) Co-ordinate isomerism
4) Polymerisation isomerism

150. Which one of the following is an organo metallic compound?

- 1) Lithium methoxide
2) Lithium acetate
3) Lithium dimethylamide
4) ☒ Methyl lithium

151. Which one of the following statements is false?

- 1) Like Al, Sc forms stable compounds only in the +3 oxidation state
2) ☒ Sc_2O_3 is amphoteric like Al_2O_3
3) Sc_2O_3 is insoluble in water as Al_2O_3
4) Sc^{3+} is larger than Al^{3+}

152. The order of decreasing (largest first) ionic radii of the following is:

- ☒ 1) $\text{La}^{+3} > \text{Sm}^{+3} > \text{Gd}^{+3} > \text{Lu}^{+3}$
2) $\text{Sm}^{+3} > \text{La}^{+3} > \text{Gd}^{+3} > \text{Lu}^{+3}$
3) $\text{Lu}^{+3} > \text{Sm}^{+3} > \text{Gd}^{+3} > \text{La}^{+3}$
4) $\text{Gd}^{+3} > \text{Sm}^{+3} > \text{La}^{+3} > \text{Lu}^{+3}$

153. The common oxidation state/states of cerium is/are :

- 1) +2 and +3
2) +2 only
3) ☒ +3 and +4
4) +4 only

154. _____ is the only synthetic lanthanide (radioactive).

- 1) Sm
2) ☒ Pm
3) Lu
4) Gd

155. Which one of the following statements is false?

- 1) The maximum oxidation state of lanthanides and actinides is +4
 2) Most of the ions of lanthanides and actinides are coloured
 3) Ions of lanthanides do not form complexes easily, where as this tendency is greater is the case of actinide lanthanides ions
 4) The oxides of actinides are more basic than those of lanthanides

156. Match List - I correctly with List - II using the codes given below:

List - I	List - II
a) Eu^{+3}	1) Radioactive
b) Cu^{+4}	2) Oxidising agent
c) U^{+6}	3) NMR
d) Pm	4) Oxocations

	a	b	c	d
A.	3	2	4	1
B.	1	2	3	4
C.	2	3	4	1
D.	4	2	1	3

157. In Breeder nuclear reactors, the fuel is:

- 1) U
 2) Np
 3) Th
 4) Pu

158. In the following nuclear reaction, ${}_{92}\text{U}^{238} + {}_0\text{n}^1 \rightarrow {}_{92}\text{U}^{239} + \text{X}$ X is:

- 1) β particles
 2) α particles
 3) Electron
 4) γ radiation

159. Match List I correctly with List II and answer using the codes given below -

List - I	List - II
a) Tc	1) Purple in colour
b) Zr and Hf	2) Diamagnetic
c) Cu^{+}	3) Synthetic
d) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	4) Lanthanide contraction

	a	b	c	d
A.	4	3	2	1
B.	3	4	2	1
C.	1	2	3	4
D.	2	3	1	4

160. Beginning with lanthanum, the electrons go, not into the valence shell, but into the _____. (From the outermost shell)

- 1) First
 2) Second
 3) Third
 4) Fourth

161. Which one of the metal carbonyls does not contain 18 valence electrons?

- 1) $\text{Ni}(\text{CO})_4$
 2) $\text{Mn}_2(\text{CO})_{10}$
 3) $\text{Fe}(\text{CO})_5$
 4) $\text{V}(\text{CO})_6$

162. Which of the following statement about the anion, $[\text{PtCl}_3 \text{C}_2\text{H}_4]^-$ is false?

- 1) It is associated with square - planar coordination of the platinum
- 2) Its formation involves replacing one of the chloride ligand in the chloro platinate anion
- 3) The two electrons of ethylene in the π -bonding orbital are donated to the metal, Pt
- 4) The ethylene molecule has its axis in the plane of PtCl_3 group

163. Match List - I correctly with List - II and select your answer using the codes given below -

List - I	List - II
a) $\text{CO}_2(\text{CO})_8$	1) Homogeneous catalyst
b) Bis - (π - Cyclopentadienyl) iron (II)	2) Poly ethylene
c) $\text{RhCl}(\text{PPh}_3)_3$	3) Bridged complex
d) TiCl_3	4) Sandwich compound

	a	b	c	d
A.	4	2	3	1
B.	2	1	3	4
C.	3	4	1	2
D.	1	2	3	4

164. Which one of the statements about ferrocene is incorrect?

- 1) Fe is in the +2 Oxidation state
- 2) The ligand is cyclopentadiene
- 3) It undergoes Friedel - crafts reaction
- 4) The two cyclopentenyl rings are staggered

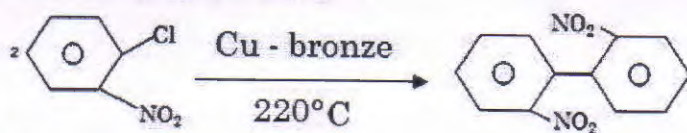
165. In the following conversion,

$$\text{C}_2\text{H}_5\text{OOC}-\text{CH}_2-\text{CH}_2-\text{COOC}\overset{\text{X}}{\longrightarrow}\text{C}_2\text{H}_5\text{OOC}-\text{CH}_2-\text{CH}_2-\text{COCH}_3$$

X is:

A.	$\text{CH}_3 \text{ MgBr}$
B.	$\text{CH}_3 \text{ Li}$
C.	$(\text{CH}_3)_2 \text{ Cd}$
D.	$\text{Zn}, \text{CH}_3\text{I}$

166. The following reaction,



is known as -

- | | |
|--|--------------------|
| A. | Sandmeyer reaction |
| <input checked="" type="checkbox"/> B. | Ullman reaction |
| C. | Wurtz synthesis |
| D. | Gomberg reaction |

167. Cytochrome oxidase requires ____ to perform its biological action.

- ☒ 1) Cu^{2+} and Fe^{3+} 2) Zn^{2+}
 3) Zn^{2+} and Fe^{2+} 4) Mg^{2+}

168. Consider the following statements about myoglobin. I) Heme part contains Fe(II) coordinated to porphyrin II) Iron is six coordinate III) A Cysteine residue of the protein chain is coordinated to Fe (II) IV) Separately, neither heme nor the protein binds oxygen in aqueous solution Choose the correct answer from the following -

- 1) I, II are true; III, IV are false 2) I, II, III are true; IV false
☒ 3) I, II, IV are true; III false 4) I, II are false; III, IV are true

169. Porphyrin is a ____ ligand

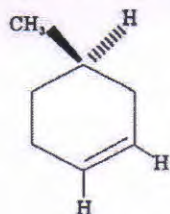
- 1) Hexadentate 2) Didentate
☒ 3) Tetradentate 4) Tridentate

170. Match List - I correctly with List - II and answer using the codes given below:

List - I		List - II			
a)	$\text{Pb}(\text{C}_2\text{H}_5)_4$	1)	Ligand is NO		
b)	$\text{Ni}(\text{CO})_4$	2)	Air pollution		
c)	LiCH_3	3)	Distillable		
d)	Brown ring	4)	Strong base		
	a	b	c	d	
A.	1	2	3	4	
B.	3	2	1	4	
<input checked="" type="checkbox"/> C.	2	3	4	1	
D.	4	3	1	2	

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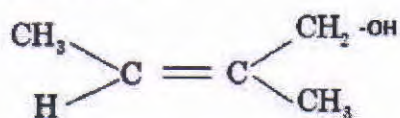
171. The configuration of the following molecule,



is:

- | | |
|--|---------|
| <input checked="" type="checkbox"/> A. | R and Z |
| B. | S and Z |
| C. | R and E |
| D. | S and E |

172. Which is the correct configuration of the following molecule?



- | | |
|--|-------|
| A. | E |
| <input checked="" type="checkbox"/> B. | Z |
| C. | Cis |
| D. | Trans |

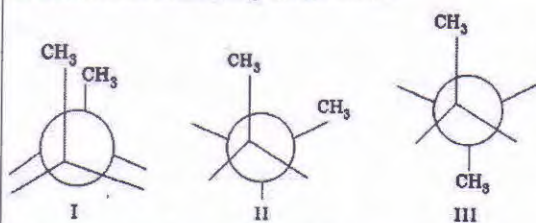
173. The correct order of dipole moments of the following compound is:

- 1) Ethylene > Chloroethene > Propene > Trans-1-chloropropene
 2) Chloroethene > Ethylene > Trans-1-chloropropene > Propene
☒ 3) Trans-1-chloropropene > Chloroethene > Propene > Ethylene
 4) Propene > Chloroethene > Trans-1-chloropropene > Ethylene

174. Which one of the following does not contain a plane of symmetry?

- 1) 1, 1 - dichloro cyclohexane
 2) Cis - 1, 3 - dichloro cyclohexane
 3) Trans - 1, 4 - dichloro cyclohexane
☒ 4) Cis - 1, 2 - Dichloro cyclohexane

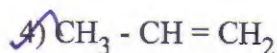
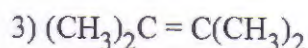
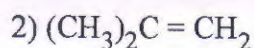
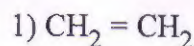
175. Consider the following conformers.



The correct order of potential energy is:

- | | |
|--|--------------|
| <input checked="" type="checkbox"/> A. | I > II > III |
| B. | III > II > I |
| C. | I > III > II |
| D. | II > III > I |

176. Consider the relative rates of bromination of the following alkenes. The highest reactivity is shown by -



177. Which one of the following statements is correct in the case of the reaction of isomeric butenes with Osmium tetroxide (OsO_4)?

1) Cis - 2 - butene gives a racemic mixture of butane - 2, 3 - diol
2) Cis - 2 - butene gives a meso intane - 2, 3 - diol

3) Trans - 2 - butene gives a meso intane - 2, 3 - diol
4) The reaction is not stereoselective

178. Upon catalytic hydrogenation, α - carotene ($\text{C}_{40}\text{H}_{56}$) gives a compound with molecular formula, $\text{C}_{40}\text{H}_{78}$. How many rings, if any are there in α - carotene?

1) 1

2) 2

3) 3

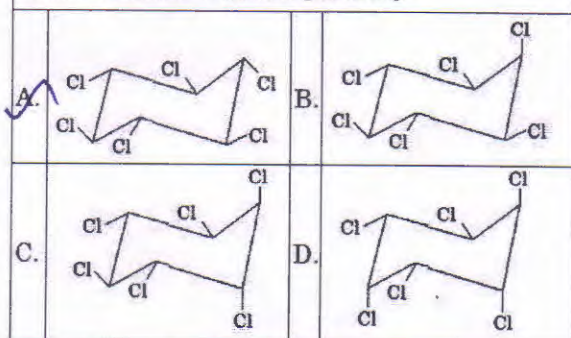
4) 4

179. The order of the reactivity of carboxylic acid and its derivatives towards LiAlH_4 is:

1) $\text{RCOOH} > \text{RCOCl} > \text{RCOOR} > \text{RCN} > \text{RCONR}_2$
2) $\text{RCOCl} > \text{RCOOH} > \text{RCOOR} > \text{RCN} > \text{RCONR}_2$

3) $\text{RCOCl} > \text{RCOOR} > \text{RCONR}_2 > \text{RCN} > \text{RCOOH}$
4) $\text{RCOOR} > \text{RCOCl} > \text{RCONR}_2 > \text{RCN} > \text{RCOOH}$

180. Of the various isomeric 1, 2, 3, 4, 5, 6 hexa chloro cyclohexanes, one isomer undergoes dehydrochlorination by much more slowly than the others. The isomer is probably -



181. Which one of the following statements is incorrect about Ziegler-Natta catalyst?

1) They are catalyst in coordination polymerisation

2) They are prepared by the interaction of alkyls of metals of groups I - III of the periodic table with halides of transition metals of group IV - VIII

3) They have square pyramidal shape

4) A combination of triethyl aluminium with titanium chloride is a typical Ziegler-Natta catalyst

182. Which one of the following is correctly matched?

1) Rubber - Synthetic polymer

3) Bakelite - thermosetting

2) Teflon - nylon

4) Adipic acid - Tetrafluoro ethylene

183. Match List - I with List - II correctly and answer using the codes given below -

List - I	List - II
a) Serine	1) Dye
b) Phenolphthalein	2) Isoelectric point
c) Alanine	3) Water repellent
d) Silicones	4) Peptide

	a	b	c	d
A.	3	2	1	4
B.	4	3	2	1
C.	4	1	3	2
3) D.	2	1	4	3

184. Assertion (A): Sucrose is a non-reducing sugar Reason (R): C_1 of the glucose residue is linked to C_2 of the fructose residue. Choose the correct answer from the following.

1) Both (A) and (R) are true, (R) is not the correct explanation of (A)

2) (A) is true but (R) is false

3) Both (A) and (R) are true, (R) is the correct explanation of (A)

4) (A) is false and (R) is true

185. Which one of the following statements is false?

1) Glucose and fructose are functional group isomers 2) Maltose is oxidised by Br_2/H_2O into a monocarboxylic acid containing 12 carbon atoms

3) Sucrose reacts with excess $C_6H_5NHNH_2$ to form an osazone 4) Lactose exhibits mutarotation

186. Which one of the following match correctly?

1) Chloromycetin - Hormone

3) Vitamin A - Beriberi

2) Eosin - Dye

4) Insulin - Antibiotic

187. Fructose reduces Tollen's reagent because -

1) It contains an aldehyde group

2) It is an α -hydroxy carbonyl compound

3) It is converted into mannose and glucose under the reaction condition 4) It contains five hydroxy groups

188. Alizarin is a/an :

1) Anthraquinone

3) Triphenylmethane

2) Azo

4) Phthalic dye

189. Which one of the following reagent is not useful for the N-terminal analysis of proteins?

A.		B.	
C.		D.	

190. Vitamin B₁ contains -

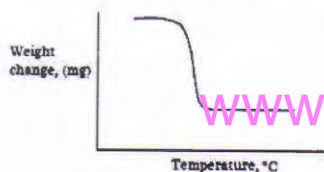
- 1) Pyridine nucleous only
- 2) Pyrimidine and thiazole nuclei
- 3) Inidazole and Pyridine nuclei
- 4) Indole and benzene nuclei

191. Which one of the following statements about retention time in gas chromatography is wrong?

- 1) It is a constant characteristic of a substance whether it is pure or in a mixture
- 2) it depends upon the operating temperature

- 3) It does not depend upon the carrier gas flow rate
- 4) It varies from column to column

192. The following thermogram,



is characteristic of -

A.	$\text{CaC}_2\text{O}_4 \cdot \text{H}_2\text{O}$
B.	$\text{ZnSiF}_6 \cdot 6\text{H}_2\text{O}$
C.	$\text{CaSiF}_6 \cdot 2\text{H}_2\text{O}$
D.	$\text{Mn}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$

193. Which one of the following method is the best for separating the lanthanides?

- 1) Chemical method
- 2) TLC
- 3) Ion exchange chromatography
- 4) HPLC

194. Which one of the following statements about the dropping Hg electrode is false?

- 1) Its surface area is reproducible with any given capillary
- 2) It does eliminate passivity
- 3) It forms amalgams with many metals and thereby increases their reduction potential
- 4) Useful for electro active species whose reduction potential is considerably more negative than the reversible potential of hydrogen discharge

195. Match List - I correctly with List - II and answer using the codes given below -

List - I	List - II
a) LaF_3 dropped with Eu(II)	1) Microwave source
b) Deuterium lamp	2) Ion selective electrode
c) Yttria - stabilised Zirconium oxide	3) UV source
d) Klystron	4) IR source

	a	b	c	d
A.	4	3	2	1
<input checked="" type="checkbox"/> B.	2	3	4	1
C.	1	2	3	4
D.	3	2	1	4

196. In mass spectrometry, $\frac{m}{e}$ values are given by -

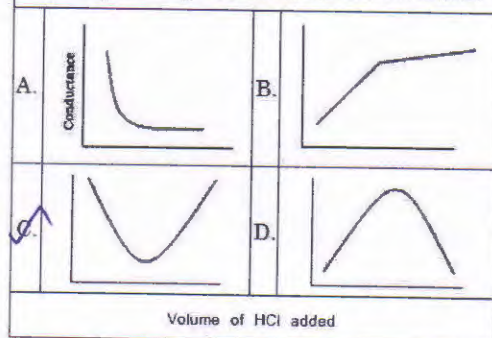
A.	$\frac{Hr^2}{2V}$
<input checked="" type="checkbox"/> B.	$\frac{H^2r^2}{2V}$
C.	$\frac{Hr}{2V}$
D.	$\sqrt{\frac{H^2r^2}{2V}}$

197. If a current of 10.00 mA passes through a chloride solution for 200 sec, what weight of chloride reacts with the silver anode?

- ☒ 1) 0.735 mg
 2) 0.0735 mg
 3) 0.00735 mg
 4) 7.35 mg

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198. 20 ml of 0.1 N aqueous NaOH is titrated against an aqueous solution of HCl. The conductance of the reaction mixture is studied as a function of volume of HCl added. Which one of the following then represents the correct variation?



199. A certain solution of KMnO_4 of concentration $1 \times 10^{-5} \text{ mol.dm}^{-3}$ gives an absorbance of 1 at 525 nm. The molar extinction of KMnO_4 is: (The path length is 1 cm)

- 1) 1×10^{-3}
 2) ☒ 1×10^5
 3) 1×10^{-5}
 4) 1×10^3

200. Which one of the following is not a redox reaction?

