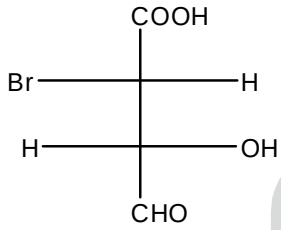
CUET-PG CHEMISTRY
YEAR-2024

PART-B CHEMISTRY

1. Assign the R and S configuration to the following molecule



(a) 2S, 3R (b) 2R, 3S (c) 2S, 3S (d) 2R, 3R

2. The ***correct*** order of the stability of different conformation of cyclohexane is

(A) chair (B) boat (C) twist boat (D) half chair

(a) (A) > (B) > (C) > (D) (b) (A) > (C) > (B) > (D)

(c) (A) > (D) > (C) > (B) (d) (D) > (C) > (B) > (A)

3. Which one is not an electrophile?

(a) NO^+ (b) BF_3 (c) CO_2 (d) NH_4^+

4. Iodoform reaction is given by

(A) All methyl ketones with CH_3CO group

(B) Acetaldehyde

(C) All secondary alcohols with $CH_3CH(OH)$ group

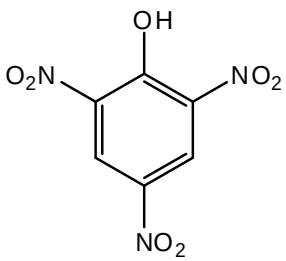
(D) All primary alcohols

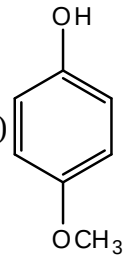
Choose the ***correct*** answer from the options given below:

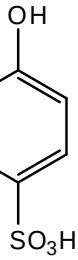
(a) (A), (B) and (D) only (b) (A), (B) and (C) only

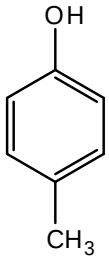
(c) (A), (B), (C) and (D) (d) (B), (C) and (D) only

5. Arrange the following compounds A, B, C and D in decreasing order of acidic strength

(A) 

(B) 

(C) 

(D) 

Choose the ***correct*** answer from the options given below:

(a) B > D > C > A (b) A > C > D > B

(c) B > A > D > C (d) B > C > A > D

6. Match **List I** with **List II**

	List I		**List II**
A.	$Ph_2C=NOH \rightarrow PhCONHPh$	I.	Knoevenagel condensation
B.	$CH_3COCH_3 \rightarrow CH_3COOCH_3$	II.	Claisen Schmidt reaction
C.	$PhCHO \rightarrow PhCH=CHCOOH$	III.	Beckmann rearrangement
D.	$PhCHO \rightarrow PhCH(OH)CH_2COCH_3$	IV.	Baeyer Villiger oxidation

Choose the ***correct*** answer from the options given below:

(a) (A)-(III), (B)-(IV), (C)-(I), (D)-(II) (b) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III) (d) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

7. Arrange the following carbonyl compounds in the decreasing order of their reactivity towards nucleophilic addition reaction

(A) CH_3CHO (B) HCHO (C) Cl_3CCHO (D) $CH_3COCH_2CH_3$

Choose the ***correct*** answer from the options given below:

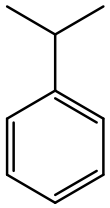
(a) A > B > C > D (b) B > A > D > C

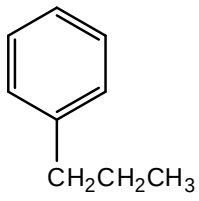
(c) B > C > A > D (d) C > B > A > D

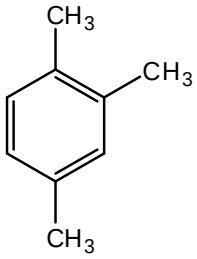
8. Number of distinct NMR signals observed in case of acetone and ethyl methyl ketone are

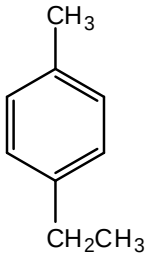
(a) 1 and 3 (b) 2 and 3 (c) 2 and 5 (d) 1 and 2

9. The structure of the compound having molecular formula C_9H_{12} showing NMR peaks at δ 7.1, 2.2, 1.5 and 0.9 ppm is

(a) 

(b) 

(c) 

(d) 

10. Which of the following vibrational mode shows no IR absorption bands

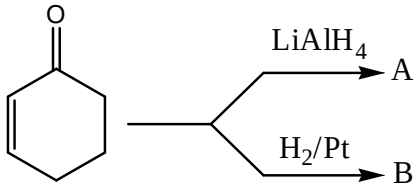
(a) Symmetric CO_2 stretch

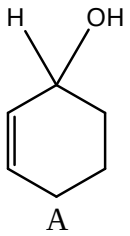
(b) Antisymmetric CO_2 stretch

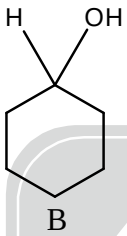
(c) Symmetric O=C=S stretch

(d) $CH_3 - C \equiv CH$ stretch

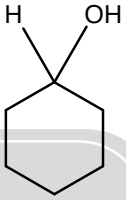
11. In the following reaction, identify the product A and B

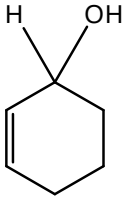


(a) 

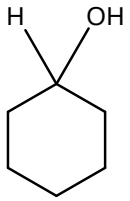
A 

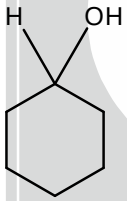
B

(b) 

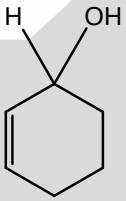
A 

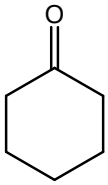
B

(c) 

A 

B

(d) 

A 

B

12. Consider the following statements with reference to Citral:

(A) Citral is a liquid which has a smell of lemon

(B) Oxidation of citral with alkaline permanganate followed by chromic acid gives acetone, oxalic and laevulic acid

(C) It also forms oxime

(D) It shows two geometrical isomers: trans isomer known as neral and cis isomer known as geranial

Choose the ***correct*** answer from the options given below:

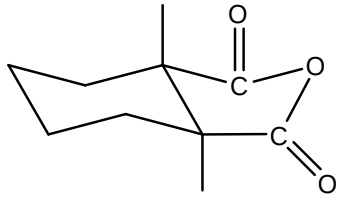
(a) (A), (B), (C) and (D)

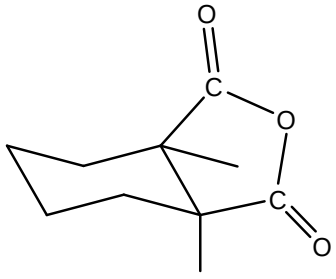
(b) (A), (B) and (C) Only

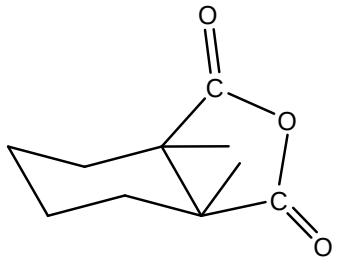
(c) (A), (B) and (D) Only

(d) (B), (C) and (D) Only

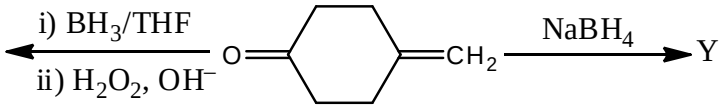
13. Which of the following isomer of 1, 2-cyclohexanedicarboxylic acid form anhydride on heating?

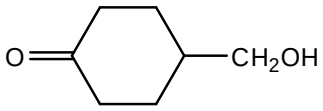
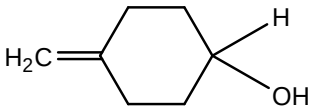
(a) 

(b) 

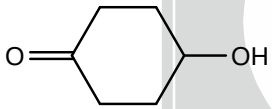
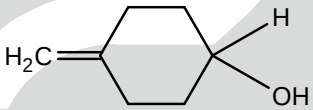
(c) 

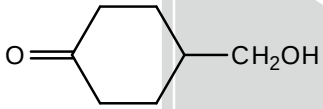
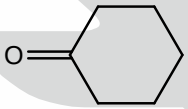
(d) Reaction not possible

14. 

(a) X =  Y = 

(b) X =  Y = 

(c) X =  Y = 

(d) X =  Y = 

15. Identify the structure of the alkaloid having the following characteristics;

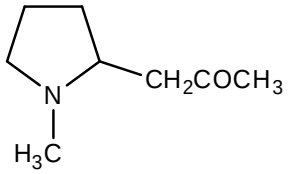
(A) It is coca alkaloid having molecular formula $C_8H_{15}NO$

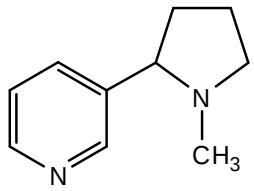
(B) As the free base, it rapidly racemizes

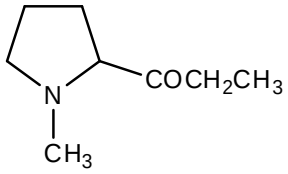
(C) Its reactions show the presence of keto group and a tertiary nitrogen atom

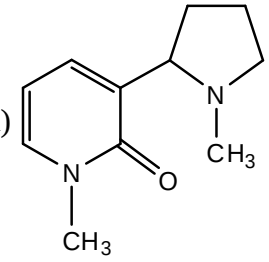
(D) Synthesized by condensing γ - methylaminobutyraldehyde with ethylacetoacetate in buffered solution at pH7

Choose the ***correct*** answer from the options given below:

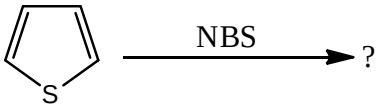
(a) 

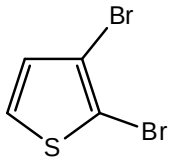
(b) 

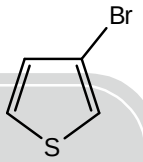
(c) 

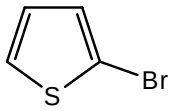
(d) 

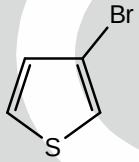
16. Identify the product in the following chemical reaction

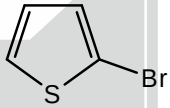


(a) 

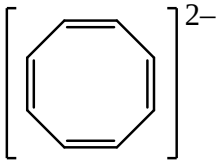
(b) 

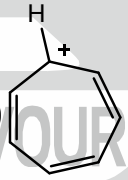
(c) 

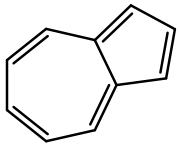
and 

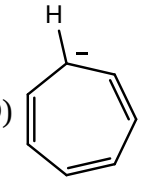
(d) 

17. Which of the following molecule is aromatic?

(A) 

(B) 

(C) 

(D) 

Choose the ***correct*** answer from the options given below:

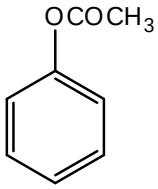
(a) (B) and (C) only

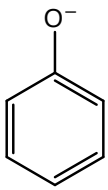
(b) (A), (B) and (C) only

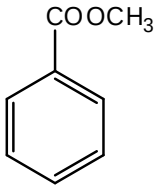
(c) (A), (C) and (D) only

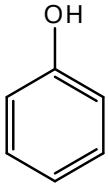
(d) (B), (C) and (D) only

18. Which of the following compounds will have the highest order of their reactivity towards electrophilic substitution reaction:

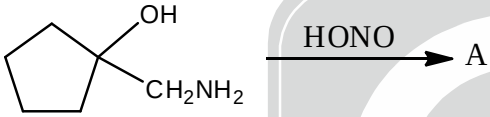
(a) 

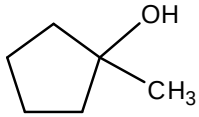
(b) 

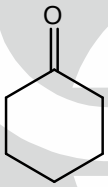
(c) 

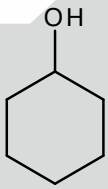
(d) 

19. Identify the product A in the following chemical reaction.



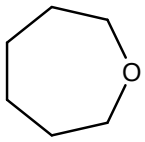
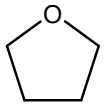
(a) 

(b) 

(c) 

(d) Reaction do not occur

20. Match **List I** with **List II**

LIST I		**LIST II**
A.		I. Oxepane
B.		II. Oxolane
C.		III. Oxetane
D.		IV. Oxirane

Choose the ***correct*** answer from the options given below:

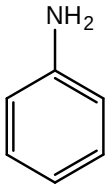
(a) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

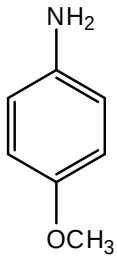
(b) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

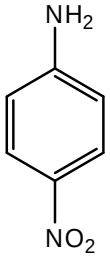
(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)

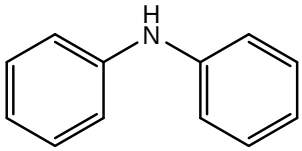
(d) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

21. To arrange the following compounds in the order of basicity:

(a) 

(b) 

(c) 

(d) 

Choose the ***correct*** answer from the options given below:

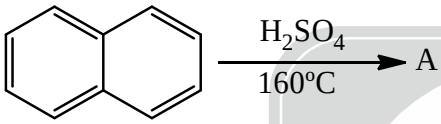
(a) (B) > (A) > (C) > (D)

(b) (D) > (C) > (B) > (A)

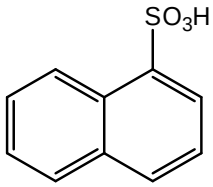
(c) (A) > (B) > (C) > (D)

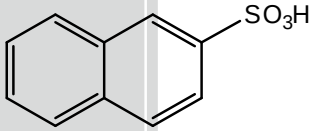
(d) (C) > (D) > (A) > (B)

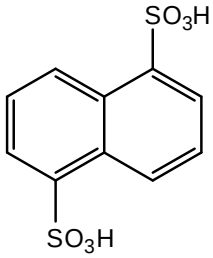
22. Write the product A in the following reaction:

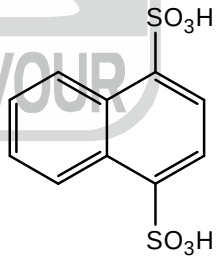


The options are

(a) 

(b) 

(c) 

(d) 

23. Consider the following statements:

(A) 1,2- addition reaction occurs faster as compared to 1,4- addition reaction but 1,4- addition product is more stable.

(B) Formation of 1,2- addition product is kinetic or rate controlled.

(C) Formation of 1,4- addition product is thermodynamic or equilibrium controlled.

(D) At low temperature the formation of 1,2- addition product from allyl cation is a reversible reaction.

Choose the ***correct*** answer from the options given below:

(a) (A), (B) and (D) only

(b) (A), (B) and (C) only

(c) (A), (B), (C) and (D)

(d) (B), (C) and (D) only

24. In S_N^1 and S_N^2 reactions

(A) S_N^1 is a unimolecular reaction with first order kinetics while S_N^2 reaction is bimolecular reaction with second order kinetics.

(B) In S_N^2, the reaction proceeds through the formation of carbocation while S_N^1 does not.

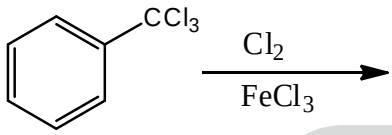
(C) S_N^2 is a stereospecific reaction. The product formed with inversion of configuration only.

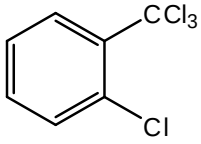
(D) S_N^1 reaction is favoured in the presence of weak base or poor nucleophile.

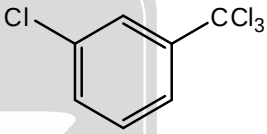
Choose the ***correct*** answer from the options given below:

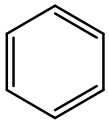
(a) (A), (B) and (D) only.
(b) (A), (B) and (C) only.
(c) (A), (C) and (D) only.
(d) (B), (C) and (D) only.

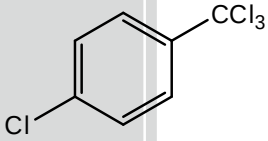
25. Find the major product in the following reaction



(a) 

(b) 

(c) 

(d) 

26. The molar ionic conductance at infinite dilution for NaOH, NaCl and $BaCl_2$ are 248.1×10^{-4}, 126.5×10^{-4} and 280.0×10^{-4}, $Sm^2\ mol^{-1}$ respectively. The Λ_m^0 for $Ba(OH)_2$ is

(a) 523.2×10^{-4}, S m^2 mol^{-1}
(b) 5.232×10^{-4}, S m^2 mol^{-1}
(c) 52.3×10^{-4}, S m^2 mol^{-1}
(d) 50.5×10^{-4}, S m^2 mol^{-1}

27. In the conductometric titration of hydrochloric acid against ammonium hydroxide

(a) The conductance increases till end point with the volume of NH_4OH added

(b) The conductance remains more or less constant till the end point

(c) The conductance remains more or less constant after the end point

(d) The conductance increases after the end point with the volume of NH_4OH added

28. The ionic strength of a solution which is 0.1 molal in NaCl and 0.01 molal in calcium Chloride is (assuming complete dissociation)

(a) 0.13 molal (b) 0.26 molal (c) 0.11 molal (d) 0.056 molal

29. From the following half-cell reactions

$Zn^{2+} + 2e^- \rightarrow Zn(s)$; $E^0_{el} = -0.76V$

$CuI + e^- \rightarrow Cu(s) + I^-(aq)$; $E^0_{el} = +0.17$ V

The standard potential E^0 of the cell

Zn, Zn^{2+} (1M) | I^- (1M), CuI; Cu will be

(a) –0.42V (b) +1.10V (c) +0.42V (d) +0.59 V

30. Match **List I** with **List II**

LIST I	**LIST II**
Energies	**Values**
A. Energy of ground state of He+	I. +6.04 eV
B. Potential energy of I orbit of H-atom	II. –27.2 eV
C. Kinetic Energy of II excited state of He^+	III. 54.4 eV
D. Ionization potential of He^+	IV. –54.4 eV

Choose the ***correct*** answer from the options given below:

(a) (A)-(IV), (B)-(II), (C)-(I), (D)-(III) (b) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)

(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III) (d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

31. The reduction potential of hydrogen half cell will be negative if

(a) $p(H_2)$ = 1 bar and $[H^+]$ = 1M (b) $p(H_2)$ = 1 bar and $[H^+]$ = 2M

(c) $p(H_2)$ = 2 bar and $[H^+]$ = 1M (d) $p(H_2)$ = 2 bar and $[H^+]$ = 2M

32. The decreasing strength of bond formed by overlap of

(A) s-s (B) p-p (C) s-p

follows the order

(a) (C), (A), (B) (b) (B), (A), (C) (c) (A), (B), (C) (d) (A), (C), (B)

33. The increasing order of molarity of 25 gm each of

(A) NaOH (B) LiOH (C) KOH (D) $Al(OH)_3$

(E) $B(OH)_3$

in same volume of water is

(a) (D) < (E) < (C) < (A) < (B) (b) (D) < (C) < (B) < (A) < (E)

(c) (B) < (A) < (C) < (E) < (D) (d) (B) < (C) < (D) < (A) < (E)

34. An electron is confined to move in a one-dimensional box of length 1Å. Its energy in the first excited state is approximately

(a) 150.4 eV (b) 112.8 eV (c) 37.6 eV (d) 342.0 eV

35. The increasing order of number of vibrational degrees of freedom from the following

(A) CO_2 (B) CH_4 (C) H_2 (D) C_2H_6

follows the order

(a) (A), (B), (C), (D) (b) (A), (D), (C), (B)

(c) (B), (A), (C), (D) (d) (C), (A), (B), (D)

36. Which of the following regarding the shapes of d -orbitals is ***not correct***

(a) d_{z^2} is a dumb-bell shaped curve symmetric about z-axis with a ring like collar in xy plan

(b) $d_{x^2-y^2}$ is double dumb-bell shaped with signs of the lobes on y-axis will xy always be positive

(c) d_{xy} is double dumb-bell shaped

(d) A 3d orbital would have no radial node

37. The magnitude of angular momentum of an electron occupying 3s atomic orbital is

(a) $\sqrt{2}\,\hbar$ (b) $\sqrt{6}\,\hbar$ (c) $\sqrt{3}\,\hbar$ (d) 0

38. Match List I with List II

LIST I (Quantity)	**LIST II (Conversion)**
A. 88g of CO_2	I. 2 mol
B. 6.023×10^{23} molecules of H_2O	II. 1 mol
C. 96g of O_2	III. 6.023×10^{23} molecules
D. 1 mol of any gas	IV. 3 mol

Choose the ***correct*** answer from the options given below:

(a) (A)-(I), (B)-(II), (C)-(IV), (D)-(III) (b) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(c) (A)-(II), (B)-(I), (C)-(III), (D)-(IV) (d) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

39. Match List I with List II

LIST I (Concentration)	**LIST II (Units)**
A. Molarity	I. mol
B. Mole Fraction	II. unitless
C. Mole	III. mol L^{-1}
D. Molality	IV. mol kg^{-1}

Choose the ***correct*** answer from the options given below:

(a) (A)-(I), (B)-(II), (C)-(IV), (D)-(III) (b) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)

(c) (A)-(II), (B)-(I), (C)-(III), (D)-(IV) (d) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

40. The plot of log k versus 1/T of a reaction is linear with a

(a) Positive slope and zero intercept (b) Positive slope and nonzero intercept

(c) Negative slope and zero intercept (d) Negative slope and nonzero intercept

41. Among the given characteristics of viscosity of liquids

(A) Greater the viscosity, more slowly the liquid flows

(B) Glass is an extremely viscous liquid

(C) Viscosity of liquid increases as the temperature rises

(D) Fluidity is the reciprocal of viscosity

Choose the ***correct*** characteristic(s) from the options given below:

(a) (A), (B) and (D) only. (b) (A) and (C) only.

(c) (B) and (C) only. (d) (A), (B), (C) and (D).

42. The Millar indices of crystal planes which cut through the crystal axes at (2a, 3b, c) are

(a) (326) (b) (231) (c) (132) (d) $(3\bar{2}\bar{2})$

43. The number of degrees of freedom for liquid water and water vapour in equilibrium at a pressure of 1 atm is

(a) 0 (b) 1 (c) 2 (d) 3

44. For a zero order reaction

(A) The rate of the reaction is independent of reactant concentration

(B) The rate constant is independent of temperature

(C) The rate constant of the reaction is independent of reactant concentration

(D) Thermal decomposition of HI on gold surface is a zero order reaction

Choose the ***correct*** feature(s) from the options given below:

(a) (A) only (b) (A) and (B) only

(c) (A), (C) and (D) only (d) (B) and (C) only

45. The unit of van der Waal's constant 'a' is

(a) $dm^3\ mol^{-1}$ (b) $dm^6\ atm\ mol^{-2}$

(c) $dm^6\ mol^{-1}$ (d) $dm^2\ atm\ mol^{-1}$

46. The expression of average speed (u_{av}) of molecules of a gas is given by

(a) $\left(\frac{8RT}{\pi m}\right)^{1/2}$ (b) $\left(\frac{8RT}{\pi M}\right)^{1/2}$ (c) $\left(\frac{3RT}{\pi m}\right)^{1/2}$ (d) $\left(\frac{3RT}{m}\right)^{1/2}$

47. Which of the following statements is ***not correct*** ?

(a) Viscosity of ethanol is smaller than that of glycol

(b) Viscosity of liquids increases with increase of pressure

(c) The variation of viscosity of liquids with temperature is given by $\eta = Ae^{-E/RT}$

(d) The volume of liquid flowing in time *t* through a pipe is given by Poisseuille equation

48. The expression relating molality (m) and mole fraction (x_2) of solute in a solution is

(a) $x_2 = \frac{mM_1}{1+mM_1}$ (b) $x_2 = \frac{mM_1}{1-mM_1}$ (c) $x_2 = \frac{1+mM_1}{mM_1}$ (d) $x_2 = \frac{1-mM_1}{mM_1}$

49. The atomic masses of $^1H = 1.673 \times 10^{-27}$ kg and $^{35}Cl = 58.06 \times 10^{-27}$ kg. The reduced mass of HCl is

(a) 162.6×10^{-27} kg (b) 16.26×10^{-27} kg

(c) 1.626×10^{-27} kg (d) 1626×10^{-27} kg

50. Match **List I** with **List II**

LIST I **(Sign of thermodynamic properties)**	**LIST II** **(Consequences)**
A. $\Delta H = -ve, \Delta S = -ve, \Delta G = -ve$	I. Reaction will be non-spontaneous at high temperature
B. $\Delta H = -ve, \Delta S = -ve, \Delta G = +ve$	II. Reaction will be non-spontaneous at low temperature
C. $\Delta H = +ve, \Delta S = +ve, \Delta G = +ve$	III. Reaction will be spontaneous at low temperature
D. $\Delta H = +ve, \Delta S = +ve, \Delta G = -ve$	IV. Reaction will be spontaneous at high temperature

Choose the ***correct*** answer from the options given below:

(a) (A)-(II), (B)-(III), (C)-(I), (D)-(IV) (b) (A)-(III), (B)-(I), (C)-(II), (D)-(IV)

(c) (A)-(III), (B)-(II), (C)-(IV), (D)-(I) (d) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

51. Calculate the wavelength (in nanometer) associated with a proton moving at 1.0×10^3 ms^{-1}.

(a) 0.032 nm (b) 0.40 nm (c) 2.5 nm (d) 14.0 nm

52. The probability of finding the electron in the px orbital is

(A) Zero at the nucleus

(B) Maximum on two opposite sides of the nucleus along X-axis

(C) Zero on Z-axis

(D) Same on all sides around the nucleus

Choose the ***correct*** answer from the options given below:

(a) (A), (B) and (D) only (b) (A), (B) and (C) only

(c) (A), (B), (C) and (D) (d) (B), (C) and (D) only

53. The ***correct*** order of decreasing ionic radii among the following isoelectronic species is

(A) K^+ (B) Ca^{2+} (C) Cl^- (D) S^{2-}

Choose the ***correct*** answer from the options given below:

(a) (A) > (B) > (C) > (D) (b) (A) > (C) > (B) > (D)

(c) (D) > (B) > (C) > (A) (d) (D) > (C) > (A) > (B)

54. Electronegativity of the following elements increases in the order

(A) C (B) N (C) Si (D) P

Choose the ***correct*** answer from the options given below:

(a) (C), (D), (A), (B) (b) (C), (A), (D), (B)

(c) (B), (A), (D), (C) (d) (C), (B), (D), (A)

55. The compound (s) with two lone pairs of electrons on the central atom is (are)

(A) BrF_5 (B) ClF_3 (C) XeF_4 (D) SF_4

Choose the ***correct*** answer from the options given below:

(a) (A), (B) and (D) only (b) (B) and (C) only

(c) (B), (C) and (D) only (d) (A), (C) and (D) only

56. Stability of the species Li_2, Li_2^- and Li_2^+ increases in the order of:

(a) $Li_2^- < Li_2 < Li_2^+$ (b) $Li_2 < Li_2^+ < Li_2^-$

(c) $Li_2^- < Li_2^+ < Li_2$ (d) $Li_2 < Li_2^- < Li_2^+$

57. SF_2, SF_4 and SF_6 have the hybridization at sulphur atom respectively as

(a) sp^2, sp^3, sp^3d^2 (b) sp, sp^3, sp^3d^2

(c) sp^3, sp^3d, sp^3d^2 (d) sp^3, spd^2, d^2sp^3

58. Oxidation state of each Cl in $CaOCl_2$ is/are

(a) 0 (b) +1 (c) –1 (d) +1, –1

59. Which of these will not be oxidised by ozone?

(a) KI (b) $FeSO_4$ (c) $KMnO_4$ (d) K_2MnO_4

60. Which one of the following is the weakest base?

(a) $Ca(OH)_2$ (b) KOH (c) LiOH (d) $Sr(OH)_2$

61. Which of the following oxides is not expected to react with sodium hydroxide?

(a) CaO (b) SiO_2 (c) BeO (d) B_2O_3

62. The basic structural unit of silicates is

(a) SiO_3^{2-} (b) SiO_4^{2-} (c) SiO^- (d) SiO_4^{4-}

63. Match **List I** with **List II**

LIST I	**LIST II**
Formula	**Structure**
A. XeO_4	I. Pyramidal
B. XeO_2F_2	II. Tetrahedral
C. XeF_4	III. Trigonal bipyramidal
D. XeO_3	IV. Square planar

Choose the ***correct*** answer from the options given below:

(a) (A)-(II), (B)-(III), (C)-(IV), (D)-(I) (b) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)

(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III) (d) (A)-(I), (B)-(III), (C)-(IV), (D)-(II)

64. Reaction of diborane with excess ammonia at low temperature gives initially

(a) $B_2H_6.NH_3$ (b) Borazole

(c) $[BH_2(NH_3)_2]^+[BH_4]^-$ (d) $B_2N_4H_{10}$

65. Match **List I** with **List II**

LIST I	**LIST II**
Ion	**Shape**
A. ICl_2^-	I. V-shape
B. NH_2^-	II. Linear
C. NH_4^+	III. Tetrahedral
D. $[PtCl_4]^{2-}$	IV. Square Planar

Choose the ***correct*** answer from the options given below:

(a) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)
(b) (A)-(III), (B)-(II), (C)-(I), (D)-(IV)
(c) (A)-(II), (B)-(I), (C)-(III), (D)-(IV)
(d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

66. Which of the following species has the highest electron affinity?

(a) F^- (b) Cl^- (c) O^- (d) Na^-

67. Arrange the increasing order of charges (molar conductivity) of the compounds used in Werner coordination theory

(A) $CoCl_3.6NH_3$ (B) $CoCl_3.5NH_3$ (C) $CoCl_3.4NH_3$ (D) $CoCl_3.3NH_3$

Choose the correct answer from the options given below:

(a) (A), (B), (C), (D)
(b) (D), (C), (B), (A)
(c) (B), (A), (D), (C)
(d) (C), (B), (D), (A)

68. What is the EAN of $[Co(NH_3)_6]^{3+}$?

(a) 36 (b) 38 (c) 35 (d) 54

69. Match **List I** with **List II**

LIST I	**LIST II**
Ions	**Magnetic moment (BM)**
A. Co^{2+}	I. 1.73
B. Mn^{2+}	II. 3.87
C. Cr^{2+}	III. 4.90
D. Cu^{2+}	IV. 5.92

Choose the ***correct*** answer from the options given below:

(a) (A)-(II), (B)-(IV), (C)-(III), (D)-(I)
(b) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)
(d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

70. Match **List I** with **List II**

LIST I	**LIST II**
Metal/compounds	**Catalytic properties**
A. $TiCl_3$	I. Adams catalyst
B. $FeSO_4$	II. Repp synthesis
C. Pt/PtO	III. Used as the Zieglar-Natta catalyst
D. Ni	IV. Used as Fenton's reagent

Choose the ***correct*** answer from the options given below:

(a) (A)-(I), (B)-(II), (C)-(III), (D)-(IV)
(b) (A)-(I), (B)-(III), (C)-(II), (D)-(IV)
(c) (A)-(I), (B)-(II), (C)-(IV), (D)-(III)
(d) (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

71. Europium(Eu) resembles Calcium(Ca) in the following ways:

(A) Both are diamagnetic

(B) Insolubility of their sulphates and carbonates in water

(C) Solubility of these metals in liquid NH_3

(D) Insolubility of their dichlorides in strong HCl

Choose the ***correct*** answer from the options given below:

(a) (A), (B) and (D) only
(b) (A), (B) and (C) only
(c) (A), (B), (C) and (D)
(d) (B), (C) and (D) only

72. The Lanthanide contraction from Ce to Lu is

(a) 0.20 Å (b) 0.10 Å (c) 0.30 Å (d) 0.25 Å

73. Mg-ATP complex is a substrate for

(a) Kinase (b) Catalase (c) Helicase (d) Hydrolyses

74. What is the oxidation state of Pd in $[Pd(OAC)_2]$?

(a) 0 (b) 1 (c) 2 (d) 3

75. Cytochrome C is a/an

(a) Electron donor (b) Electron acceptor (c) Neutral (d) Negatively charged