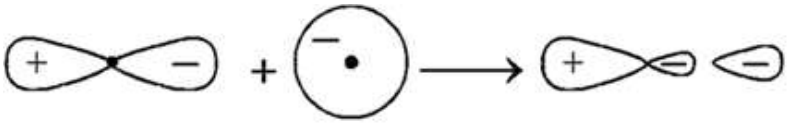
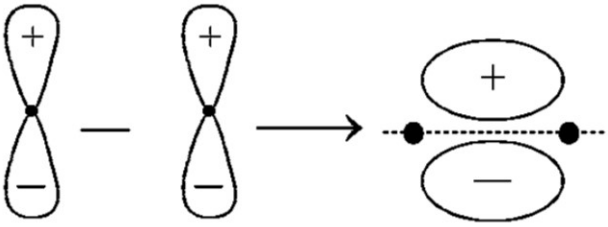
PART (B) : CHEMISTRY

SINGLE CORRECT ANSWER TYPE

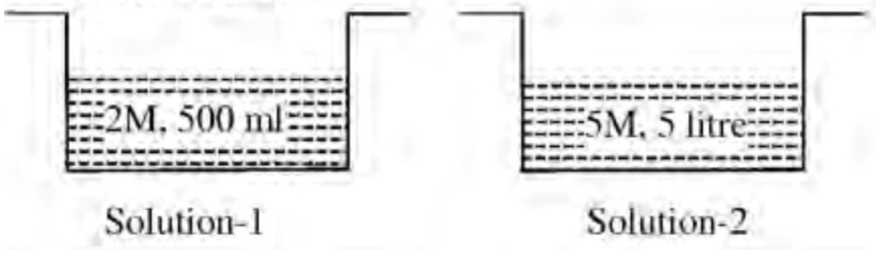
This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and –1 in all other cases.

31. Which of the following statement is not correct?
(A) In the transition elements the incoming electron occupy $(n-1)d$ subshell in preference to np.
(B) Elements having atomic number 57 to 71 belong to same group
(C) Lanthanum is the first element of Lanthanoids
(D) Actinium violets the Aufbau's principle

32. Which of the following combination of orbitals is correct?
(A) 
(B) 
(C) 
(D) 

33. There are two aqueous HCl solutions kept in different vessel.

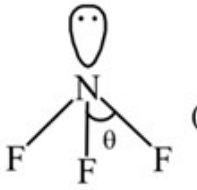


How much solution-2 should be added to solution-1 in order to make 2.5 M HCl solution?
(A) 100 ml
(B) 200 ml
(C) 500 ml
(D) 2 litre

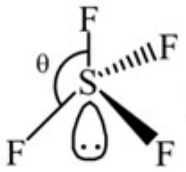
34. The sum of "number of filled orbitals" and "number of vacant orbitals" upto valence shell of Fe is
(A) 15
(B) 25
(C) 30
(D) 35

35. A sample of hydrogen atoms de-exites from 6^{th} excited state to the ground state in one or more electronic transitions. If no spectral line is obtained in the Paschen and Brackett series, then the maximum number of spectral lines of different photon energies obtained will be -
(A) 21
(B) 15
(C) 10
(D) 7

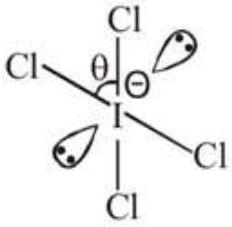
36. Which of the following structure is correctly drawn according to fundamental idea of VSEPR theory?

(A) 

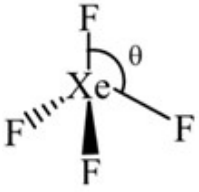
$(\theta > 109°28')$

(B) 

$(\theta < 90°)$

(C) 

$(\theta = 90°)$

(D) 

$(\theta = 109°28')$

37. The mole fraction of solvent in an aq. solution is 0.7. The molality (in mol kg^{-1}) of the aqueous solution is :
(A) 13.88 mol kg^{-1}
(B) 23.80 mol kg^{-1}
(C) 194.44 mol kg^{-1}
(D) 1.38 mol kg^{-1}

38. A stream of electron from a heated filament was passed between two charge plates kept at a potential difference V. It e and m are charge and mass of electron respectively, the value of $\frac{h}{\lambda}$ (where λ is wavelength associated with electron wave)
(A) 2 meV
(B) $\sqrt{meV}$
(C) $\sqrt{2meV}$
(D) meV

39. Select the correct ionisation energy order
(A) Ag < Cu < Au
(B) O < N < F
(C) La < Y < Sc
(D) All of these

40. Which of the following order is **incorrect?**
(A) $Cl^- < K^+ < Ca^{+2}$ (I.E.)
(B) Pd < Ag (I.E.)
(C) $Li^+ > Na^+$ (E.A.)
(D) Mg^{+2} (aq) < Ca^{+2} (aq) (ionic mobility)

41. A M^{+2} ion derived from a metal in the first transition metal series has four electrons in 3d shubshell. What element may M be?
(A) S
(B) Cr
(C) Mn
(D) None

42. Which of the following set of quantum numbers represent the highest energy level of a multi electron atom?
(A) $n = 3, \ell = 1, m = 1, s = +1/2$
(B) $n = 3, \ell = 2, m = 1, s = +1/2$
(C) $n = 4, \ell = 0, m = 0, s = +1/2$
(D) $n = 3, \ell = 0, m = 0, s = +1/2$

43. The theoretical magnetic moment of cobalt (Co) after removing three electrons is
(A) 3.87 BM
(B) 4.90 BM
(C) 1.73 BM
(D) 2.84 BM

44. Match the Column: (For molecular geometry)

	Column-I		**Column-II**
(a)	SF_4	(P)	Tetrahedral
(b)	BrF_3	(Q)	Pyramidal
(c)	BrO_3^-	(R)	See-saw
(d)	NH_4^+	(S)	T-shape (Bent T)

(A) a-P, b-Q, C-R, d-S
(B) a-S, b-R, C-P, d-Q
(C) a-R, b-S, C-Q, d-P
(D) a-Q, b-S, C-R, d-P

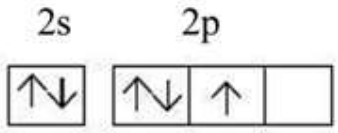
45. A compound has haemoglobin like structure. It has one Fe. It contain 4.6% of Fe. The approximate molecular mass is (Atomic mass of Fe = 56)
(A) 1400 g mol^{-1}
(B) 1000 g mol^{-1}
(C) 1100 g mol^{-1}
(D) 1200 g mol^{-1}

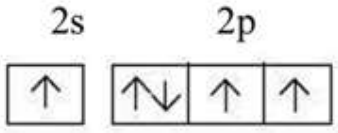
46. An organic compound containing C and H has 92.3% of carbon. Its empirical formula is
(A) CH_4
(B) CH_3
(C) CH_2
(D) CH

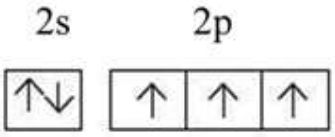
47. Assuming fully decomposed, the volume of CO_2 released at NTP on heating 9.85 g of $BaCO_3$ (atomic mass, Ba = 137) will be
(A) 2.24 l
(B) 4.96 l
(C) 1.12 l
(D) 0.84 l

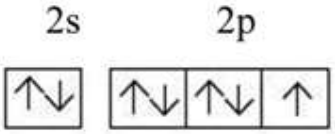
48. Each p-orbital and each d-orbital has lobes respectively as
(A) 2, 4
(B) 1, 2
(C) 2, 2
(D) 1, 1

49. The orbital diagram in which the Aufbau principle is violated is

(A) 

(B) 

(C) 

(D) 

50. The number of d-electrons in Ni (atomic number = 28) is equal to that of the
(A) d-electrons in Ni^{2+}
(B) Total electrons in N (atomic number = 7)
(C) s and p-electrons in F^-
(D) p-electrons is Ar (atomic number = 18)

NUMERICAL VALUE TYPE

This section contains 10 questions. **Attempt any 5 questions out of 10.** Each question is numerical value type. For each question, enter the correct numerical value (in decimal notation (e.g. 6.25, 7.00, 7, –0.33, –.30, 30.27, –127.30).

Marking scheme: +4 for correct answer, 0 if not attempted and 0 in all other cases.

51. Which of the following bond angle is related to NO_2 molecule.
120^o, 109^o, 115^o, 180^o, 134^o
Fill your answer as sum of digits.

52. Find the number of planner species out of the following species
SF_2, SF_4, SF_6, SO_2, SO_3

53. During formation of NaCl, from Na(s) and $Cl_2(g)$, how many steps are endothermic
(a) $Na(s) \rightarrow Na(g)$
(b) $\frac{1}{2}Cl_2(g) \rightarrow Cl(g)$
(c) $Na(g) - e^- \rightarrow Na^+(g)$
(d) $Cl(g) + e^- \rightarrow Cl^-(g)$
(e) $Na^+(g) + Cl^-(g) \rightarrow NaCl(s)$

54. Considering VSEPR and find number of molecule(s) in which two "O" atoms are opposite to each other at central atom:
O_3, CO_2, SO_2Cl_2, XeO_3F_2, XeO_2F_4, XeO_4

55. By a sample of ground state atomic hydrogen, UV light of energy $\frac{13.6\times48}{49}\frac{eV}{quanta}$ is absorbed. How many different wavelengths will be observed in Balmer region of hydrogen spectrum?

56. Sum of % p-character used in hybridisation of central atom of given molecules.
XeO_3F_2, SO_3 & NF_4^+

57. 25 ml of a solution of barium hydroxide on titration with 0.1 molar solution of hydrochloric acid gave a titre value of 35 ml. The molarity of barium hydroxide solution was

58. When the azimuthal quantum number has the value of 2, the number of orbitals possible are

59. Gaseous transition metal ion M^{2+} has 5 unpaired electrons. What is its minimum atomic number?

60. The number of wave made by a Bohr electron in an orbit of maximum magnetic quantum number 3 is