Chemistry

TARGET : JEE 2013

SCORE

JEE (Advanced)

Home Assignment # 02

ALLEN CAREER INSTITUTE
KOTA (RAJASTHAN)
Path to Success

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PHYSICAL CHEMISTRY

Ionic Equilibrium, Chemical Equilibrium, Real gas

Only one correct ::

1. For a gaseous homogeneous reaction -

$2A\ (g) + B\ (g) \rightleftharpoons 2C\ (g) + 2D\ (g)$

$\Delta G^\circ = 0.693\ RT$ at TK. K_p for the reaction in kPa units is :

(A) 50 (B) 0.5 (C) 500 (D) 5

2. Gas phase isomerisation reactions $A\ (g) \rightleftharpoons B\ (g)$; $A\ (g) \rightleftharpoons C\ (g)$; $B\ (g) \rightleftharpoons C\ (g)$ reach equilibrium at fixed temperature, T.K. then mole fraction of gas A in terms of equilibrium constants K_1 and K_2 of reactions $A \rightleftharpoons B$ & $A \rightleftharpoons C$ is :

(A) $\frac{K_1}{1+K_1+K_2}$ (B) $\frac{1}{1+K_1+K_2}$ (C) $\frac{K_2}{1+K_1+K_2}$ (D) None of these

3. For the reaction $A(aq) \rightleftharpoons B(aq) + 2C(aq)$ K_c at 25°C is 4×10^{-19}. Concentration of B in a solution that had originally C and B concentration of 0.1 M and 0.03 M respectively is :

(A) 0.03 M (B) 7.5×10^{-12} M (C) 7.5×10^{-15} M (D) 7.5×10^{-18} M

4. Calculate the degree of dissociation of H_2S gas if 0.1 mole of H_2S gas is taken in vessel of volume 0.4 litre at 1000 K. K_C for the reaction :

$2H_2S\ (g) \rightleftharpoons 2H_2\ (g) + S_2\ (g)$ is 10^{-9} at 1000 K

(A) 0.008 (B) 0.004 (C) 0.08 (D) 0.002

5. For the gas phase reaction $SO_3(g) \rightleftharpoons SO_2(g) + O_2(g)$ if the gaseous mixture in a closed container is allowed to come at equilibrium and the degree of dissociation (α) at equilibrium is found to be 2/3 at 400 K and 1 atm pressure calculate the vapour density of the equilibrium mixture -

(A) 30 (B) 60 (C) 50 (D) 40

6. For equilibrium at 300 K, $LiCl_3.3NH_3(s) \rightleftharpoons LiCl.NH_3\ (s) + 2NH_3\ (g)$; $Kp = 9\ atm^2$

In 8.21 L vessel 1.4 mol of $LiCl.NH_3\ (s)$ and 2.8 moles of NH_3 are placed. Moles of $LiCl_3.3NH_3(s)$ formed will be :

(A) 1.4 (B) 0.7 (C) 0.9 (D) 1

7. The pressure of an equilibrium mixture of the three gases NO, Cl_2 and NOCl, $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ is suddenly decreased by doubling the volume of the container at constant temperature. When the system returns to equilibrium :

(A) the concentration of NOCl will have increased

(B) the value of the equilibrium constant K_c will have increased

(C) the number of moles Cl_2 will have increased

(D) the number of moles of NOCl will have increased

8. A volatile liquid A_2B_4 (M.wt. = 200) has the following equilibrium at an elevated temperature :

$$A_2B_4(g) \rightleftharpoons A_2(g) + 2B_2(g)$$

0.01 gm of A_2B_4, at an elevated temperature displaced 2.27 mL of dry air at S.T.P. The degree of dissociation of A_2B_4 under experimental conditions, is :

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{8}$ (D) $\frac{3}{7}$

9. $2AB_2 \rightleftharpoons 2AB + B_2$

Degree of dissociation of AB_2 is x. What will be equation for x in terms of K_P and equilibrium pressure P ?

(A) $\frac{x^3}{(2+x)(1-x)^2} \times P$ (B) $x = \sqrt[3]{\frac{P}{2K_p}}$ (C) $x = \sqrt{\frac{2K_p}{P}}$ (D) $\frac{x^2}{(2+x)(1-x)} \times P$

10. Given K_a values of 5.76×10^{-10} and 4.8×10^{-10} for NH_4^+ and HCN respectively. What is the equilibrium constant for the following reaction :-

$$NH_4CN(aq) \rightleftharpoons NH_3(aq) + HCN\ (aq)$$

(A) 0.83 (B) 1.2 (C) 8.0×10^{-11} (D) 27.6×10^{-10}

11. For the reversible reaction net rate is : $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

$\left(\frac{dx}{dt}\right)_{net} = 2.6 \times 10^3 [NO]^2 [O_2] - 4.1 [NO_2]^2$

If a reaction mixture contains 0.01 mol each of NO and O_2 and 0.1 mol of NO_2 in 1 L closed flask, then above reaction is :-

(A) Shifted in forward direction (B) Shifted in backward direction

(C) In equilibrium (D) Given values are incomplete

12. At same temperature N_2O_4 is dissociated to 40% & 50% at total pressure P_1 & P_2 atm respectively in NO_2. Then the ratio of P_1 & P_2 is -

(A) 4/5 (B) 7/4 (C) 4/7 (D) None of these

13. The concentration of $H^{\oplus}$ ions due to water in a 10^{-6} M aqueous solution of CH_3COOH is : [K_a (CH_3COOH) = 1.8×10^{-5}].

(A) 1.04×10^{-5} M (B) 1.04×10^{-8} M (C) 3.4×10^{-7} M (D) 2.42×10^{-9} M

14. pH of a solution containing 0.2 M H_2CO_3 and 0.1 M CO_3^{-2} is -

(For H_2CO_3 : $K_{a_1} = 4 \times 10^{-7}$; $K_{a_2} = 4 \times 10^{-11}$) :

(A) 6.4 (B) 10.4 (C) 5.8 (D) 6.7

15. 100 mL of 0.1 M HCOOH ($K_a = 2 \times 10^{-4}$) was titrated with 0.05 M NaOH. pH of solution on adding 40 mL of base is :

(A) 3.7 (B) 4.1 (C) 3.1 (D) 8.1

16. A saturated solution of barium formate $(HCOO)_2$ Ba contains 0.6 mole in 2 litre solution. pOH of solution is 4.6. pK_a of formic acid (HCOOH) is ?

(A) 4.8 + log 0.6 (B) 4.8 + log 0.3 (C) 9.4 – log 0.6 (D) 4.8 – log 0.6

17. The indicator constant of phenolphthalein is approximately 10^{-10}. A solution is prepared by adding 101 c.c. of 0.01 N sodium hydroxide to 100.00 c.c. of 0.01 N hydrochloric acid. If a few drops of phenolphthalein are now added, what fraction of the indicator is converted to its coloured form ?

(A) $\frac{2}{3}$ (B) $\frac{3}{4}$ (C) $\frac{1}{2}$ (D) $\frac{9}{11}$

18. K_{sp} of $Al(OH)_3$ and $Zn(OH)_2$ are 2.7×10^{-24} and 3.2×10^{-14} respectively. If to a solution of 0.1 M each of Al^{+3} and Zn^{+2} ions NH_4OH is added slowly, which will precipitate first :

(A) $Zn(OH)_2$ (B) $Al(OH)_3$ (C) both at same time (D) none of these

19. The increasing order of Ag^+ ion concentration in :

(I) Saturated solution of AgCl (II) Saturated solution of AgI

(III) 1M $Ag(NH_3)_2^+$ in 0.1 M NH_3 (IV) 1M $Ag(CN)_2^-$ in 0.1 M KCN

Given : $K_{sp}(AgCl) = 10^{-10}$; $K_{sp}(AgI) = 10^{-16}$, $K_f(Ag(NH_3)_2^+) = 10^8$; $K_f(Ag(CN)_2^-) = 10^{11}$

(A) II < I < III < IV (B) IV < III < II < I

(C) IV < II < III < I (D) IV < II < I < III

20. 150 ml of 0.5 M HCN ($K_a = 3.75 \times 10^{-9}$) was titrated with 1.5 M KOH for complete neutralisation. Molarity is HCN at equilibrium will be (at end-point)

(A) 10^{-11} M (B) 10^{-3} M (C) 0.375 M (D) zero

21. pH of a solution by mixing 50 mL of 0.1 M Na_3PO_4 and 50 mL of 0.05 M NaH_2PO_4 is :

For H_3PO_4 : $pK_1 = 2.1$, $pK_2 = 7.2$, $pK_3 = 12$

(A) 9.6 (B) 4.65 (C) 7.2 (D) none of these

22. A solution is saturated with respect to $SrCO_3$ and SrF_2. The $[CO_3^{2-}]$ was found to be 1.2×10^{-3} M. The concentration of F^- in the solution would be : (Given : $K_{sp}(SrCO_3) = 7.0 \times 10^{-10} M^2$, $K_{sp}(SrF_2) = 7.9 \times 10^{-10} M^3$)

(A) 1.3×10^{-3} M (B) 2.6×10^{-2} M (C) 3.7×10^{-2} M (D) 5.8×10^{-7} M

23. The dissociation constants of HF and HNO_2 are 6.0×10^{-4} and 2.0×10^{-4} respectively. The pH of a solution which is a mixture of 0.5 mol L^{-1} of HF and 0.5 M HNO_2 is : **(take log 2 = 0.30)**

(A) 2.00 (B) 1.70 (C) 2.30 (D) 1.90

24. Give the correct initial for the following option :

(I) If $[OH^-]$ is 1×10^{-8} g ion/L, then its pH = 8 (II) If $[H^+]$ is 10^{-2} g ion/L, then its pOH = 12

(III) If 50 mL of 10^{-3} M HCl solution, then its pH = 3

(IV) If 100 mL of 10^{-3} M NaOH solution is mixed with 900 mL water then its pH = 4

(A) T T T F (B) F F T T (C) F T T F (D) T F F T

25. The equilibrium constant for the reaction of CH_3COOH with NaOH is :

(Given : $K_b(CH_3COO^-) = 10^{-9}$)

(A) 10^{10} (B) 10^8 (C) 10^9 (D) None

26. A weak acid HA after treatment with 10 ml of 0.1M strong base BOH has a pH of 5. At the end point the volume of same base required is 30 ml. K_a of acid is - (log 2 = 0.3, log 5 = 0.7)

(A) 2×10^{-6} (B) 5×10^{-6} (C) 2×10^{-5} (D) 5×10^{-5}

27. Which of the following can not act as buffer solution -

(A) 30 ml 0.1M CH_3COOH + 10 ml 0.3M NH_4OH

(B) 10 ml 0.2M Na_2CO_3 + 20 ml 0.2M H_2CO_3

(C) 30 ml 0.1M HCl + 10 ml 0.1M Na_3PO_4

(D) 10 ml 0.1M NH_4Cl + 5 ml 0.1M NaOH

28. The density of a gaseous substance at 1 atm pressure and 773 K is 0.4 g/L. If the molecular weight of the substance is 30 the forces existing among gas molecules is :

(A) repulsive (B) attractive (C) both (D) none

29. One way of writing the equation of state for real gases is $PV = RT\left[1+\frac{B}{V}+....\right]$

where B is a constant. An approximate expression for B in terms of the vander Waals constant 'a' and 'b' is

(A) $B = a-\frac{b}{RT}$ (B) $B = b-\frac{a}{RT}$ (C) $B = RT-\frac{a}{b}$ (D) $B = b-\frac{RT}{a}$

30. 0.5 mol of a diatomic gas present in 10 L vessel at certain temperature exert a pressure of 0.96 atm. Under similar conditions an ideal gas exerted 1.0 atm pressure. If volume of gas molecules is negligible then, the value of vander waals constant "a" (in atm L^2/mol^2) is :

(A) 4 (B) 16 (C) 32 (D) None of these

31. If the vander waal's parametres of two gases are given as

	a/dm^6 bar mol^{-2}	b/dm^3 mol^{-1}
Gas A	6.5	0.056
Gas B	18.0	0.011

Then :

(1) Critical volume of B > Critical volume of A

(2) Critical temperature of A > Critical temperature of B

(3) Critical pressure of A > Critical pressure of B

Which of the above statements is/are correct ?

(A) 1 and 2 (B) 2 and 3 (C) 1,2 and 3 (D) 1 alone

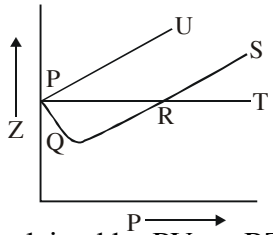
32. At moderate pressure, the compressibility factor (z) of a gas is given by :

$Z = 1 + 0.25\ P - \frac{160\,P}{T}$ (P in atm and T in Kelvin)

What is Boyle's temperature of this gas :

(A) 298 K B) 640°C (C) 470 K (D) 367°C

33. The figure shows the effect of pressure on the compressibility factor Z of a gas. The **wrong** conclusion is -



(A) The curve PU and RS can be explained by $PV_m = RT + Pb$

(B) The curve PT can be explained by $PV_m = RT$

(C) The curve PQ can be explained by $PV_m = RT - \frac{a}{V_m}$

(D) PQ shows that the gas is less compressible than ideal gas.

34. Calculate the amount of He (in gm) present in the 10 litre container at 222 atm and 300K. Given value of "b" for He is 0.08 $dm^3\ mol^{-1}$; R = 0.08 atm lit $mol^{-1}K^{-1}$.

(A) 212 (B) 302 (C) 102 (D) 516

35. One litre of a gas at 300 atm and 473 K is compressed to a pressure of 600 atm and 273 K. The compressibility factors are 1.072 and 1.375 respectively at initial and final states. What will be the final volume :

(A) 307.8 mL (B) 370.1 mL (C) 22.4 mL (D) 740.2 mL

One or more than may be correct ::

36. Select correct statement for a real gas.

(A) Larger the value of $\frac{T_c}{P_c}$ of gas, larger would be the excluded volume

(B) Critical temperature (T_c) of a gas is greater than Boyle's temperature (T_b)

(C) At critical point in the Vander Waal's gas isotherm $\left(\frac{\partial P}{\partial V}\right)_{T_c} = 0$

(D) For a real gas T_c = 30°C then it is gas at 25°C & vapour at 35°C always.

37. Select the correct statement(s):

(A) For a real gas compressibility factor, $Z = \frac{V_{real}}{V_{ideal}}$, where V_{real} may or may not be equal to volume of container in which real gas is present.

(B) IF Boyle's temperature of a gas is 400 K, then it can be liquified at 100 K.

(C) At Boyle's temperature for fixed amount of gas if pressure is doubled, the volume become half (Assuming pressure is still low)

(D) If 1 mole of an ideal gas occupy 20 litre at 273 K in low pressure region, volume occupied by 1 mole of real gas must be less than 20 litre under similiar conditions

38. Select the correct statement(s):

(A) At critical conditions volume occupied by the gas is 12 times the volume of 1 mole gaseous molecules.

(B) A gas can be liquified above its T_b (Boyle's temperature) by application of pressure.

(C) At very high pressure and moderate temperature, the volume of n mole real gas is equal to $\frac{nRT}{P}$ +nb.

(D) For a real gas following equation $\left(P + \frac{\alpha}{TV^2}\right)(V-\beta) = RT$, where α & β are constant; Boyle's temperature is $\sqrt{\frac{\alpha}{R\beta}}$

39. Which of the following statements is/are wrong ?

(A) At equilibrium, concentration of reactants and products become constant because the reaction stops

(B) Addition of catalyst speeds up the forward reaction more than the backward reaction

(C) Equilibrium constant of an exothermic reaction decreases with increases of temperature

(D) K_p is always greater than K_c

40. Which of the following statements are correct for temperature dependence of an exothermic reverssible reaction :

(A) On increasing temperature, K_f increases while K_b decreases.

(B) On increasing temperature, both K_f and K_b increases.

(C) On increasing temperature, increase in K_b must be more than increases in K_a.

(D) On increasing temperature percentage increase in K_b will be more than percentage increases in K_f.

41. Ionization constants (K_a) for three weak monobasic acids HA, HB and HD are 10^{-5}, 10^{-7} and 10^{-13} respectively at 25°C. Which of the following is (are) correct deduction for equimolar solutions of each :-

(A) $(pH)_{NaA} < (pH)_{NaB}$ (B) $(pH)_{NaD} < (pH)_{NaB}$ (C) $(pH)_{NaA} < (pH)_{NaD}$ (D) $(pH)_{NaB} = 7$

42. At 90°C pure water has $[H^+] = 10^{-6}$ M. Based on this correct statement is (are) -

(A) Increasing the temperature, increases degree of ionization of water.

(B) At 60°C, pH of pure water will be less than 6

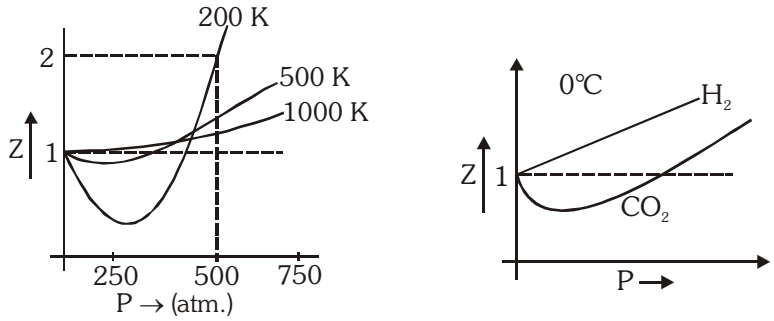
(C) At 90°C, pH of a 10^{-6} M HCl solution will be less than 6

(D) Ionization constant (K_a) of H_2O at 90°C is 10^{-12}

Paragraph ::

Paragraph for Question 43 to 45

Sketch shows the plot of Z v/s P for a hypothetical gas for one mole at three distinct temperature.



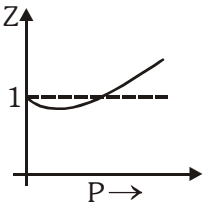
Boyle's temperature is the temperature at which a gas shows ideal behaviour over a pressure range in the low pressure region. Boyle's temperature $(T_b) = \frac{a}{Rb}$. If a plot is obtained at temperatures well below Boyle's temperature then the curve will show negative deviation, in low pressure region and positive deviation in the high pressure region. Near critical temperature the curve is more likely as CO_2 and the temperature well above critical temperature curve is more like H_2 at 0°C as shown above. At high pressure suppose all the constant temperature curve varies linearly with pressure according to the following equation : $Z = 1 + \frac{Pb}{RT}$

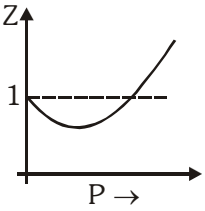
43. For 500 K plot value of Z changes from 2 to 2.2 if pressure is varied from 1000 atm to 1200 atm (high pressure) then the value of $\frac{b}{RT}$ will be :

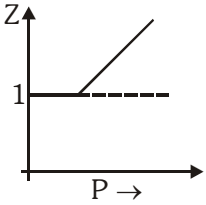
(A) 10^{-3} atm^{-1} (B) 2×10^{-3} atm^{-1}

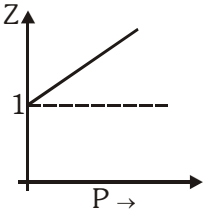
(C) 5×10^{-4} atm^{-1} (D) 10^{-4} atm^{-1}

44. Plot at Boyle's temperature for the gas will be :

(A) 

(B) 

(C) 

(D) 

45. In very high pressure region if Z v/s P is plotted at 1200 K for the above gas then it will have greatest slope as compared to other plots shown for the gas :

(A) True (B) False (C) Can't say (D) not related to the paragraph

Paragraph for Question 46 to 48

The vapour density of a reacting gaseous mixture varies as the reaction occurs and composition of mixture changes with time. The vapour density of equilibrium mixture is used to determine degree of dissociation of reactants or value of K_P for the reaction. In the reaction :

$3A(g) \rightleftharpoons B(g) + C(g)$

initially pure A was taken in vessel. The vapour density of final mixture is observed to be 70 at 200°C and 50 at 250°C at same pressure.

46. The observation shows that :

(A) the reaction is exothermic

(B) the reaction is endothermic

(C) degree of dissociation of A is independent of temperature

(D) none of above

47. The correct statement is :

(A) for exothermic reaction on increasing temperature the rate constant of forward reaction decreases while rate constant for backward reaction increases thus K_P decreases

(B) vapour density of gas mixture due to reaction in a closed vessel $NH_2COONH_4(s) \rightleftharpoons 2NH_3(g) + CO_2(g)$ decreases as pure solid dissociates

(C) vapour density of reacting mixture does not depend on pressure.

(D) none of these

48. For the reaction given in the passage above :

(A) as dissociation of A increases, vapour density increases

(B) more degree of dissociation of A less is vapour density of mixture

(C) degree of dissociation of A is independent of volume changes

(D) degree of dissociation and vapour density cannot be correlated

Paragraph for Question 49 to 51

An equilibrium mixture of $PCl_5(g)$, $PCl_3(g)$ and $Cl_2(g)$ contain 2 mole each of three gases at total pressure of 6 atm in a container of volume 1 L at temperature T. Now 2 mole of He gas is introduced in the vessel and volume is decreased isothermally till new equilibrium pressure become 12 atm.

49. What is the value of equilibrium constant K_P(atm) at temperature T for reaction :

$$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$$

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

50. After addition of He gas and decrease of volume, what is the mole fraction of PCl_5 at second equilibrium

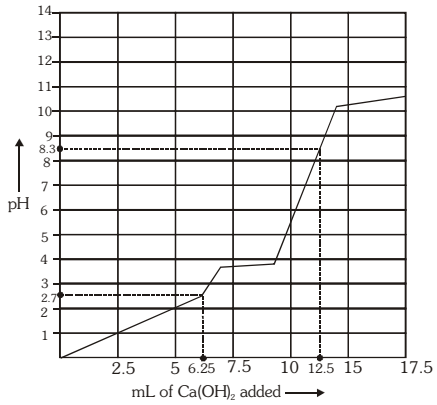
(A) $\frac{2}{7}$ (B) $\frac{3}{7}$ (C) $\frac{2}{9}$ (D) none of these

51. What is the final volume of the vessel at 2nd equilibrium :

(A) 0.643 L (B) 0.682 L (C) 0.862 L (D) none of these

Paragraph for Question 52 to 54

12.5 mL of 0.1 M aqueous solution of dibasic acid H_2X is titrated with 0.1 M $Ca(OH)_2$ solution. The titration curve obtained is shown in figure given.



log 5 = 0.7, log 2 = 0.3

52. pKa_1 of H_2X is :

(A) 8.3 (B) 1.2

(C) 1.5 (D) 4.2

53. What is pH of solution on adding 7.5 mL of $Ca(OH)_2$?

(A) 5.37 (B) 4.37

(C) 3.7 (D) 3.3

ANSWERS KEY-PHYSICAL CHEMISTRY

1.	(A)	2.	(B)	3.	(D)	4.	(D)
5.	(A)	6.	(C)	7.	(C)	8.	(B)
9.	(A)	10.	(B)	11.	(B)	12.	(B)
13.	(B)	14.	(D)	15.	(C)	16.	(D)
17.	(A)	18.	(B)	19.	(C)	20.	(B)
21.	(D)	22.	(C)	23.	(B)	24.	(C)
25.	(C)	26.	(B)	27.	(C)	28.	(A)
29.	(B)	30.	(B)	31.	(D)	32.	(D)
33.	(D)	34.	(A)	35.	(B)	36.	(A,C)
37.	(B,C)	38.	A,C,D)	39.	(A,B,D)	40.	(B,D)
41.	(A,C)	42.	(A,C)	43.	(A)	44.	(C)
45.	(B)	46.	(A)	47.	(D)	48.	(A)
49.	(A)	50.	(A)	51.	(A)	52.	(C)
53.	(D)						

INORGANIC CHEMISTRY

Coordination Chemistry & Metallurgy

Only one correct ::

Q.1 Which type of isomerism is not exhibit by the complex -

$[Co(gly)(NH_3)_3Br]\ Cl$

(A) Ionization isomerism (B) Geometrical isomerism

(C) Optical isomerism (D) Linkage isomerism

Q.2 $[\overset{III}{C}o(NH_3)_5L]SO_4$

Above octahedral complex is exist in two different coloured form when 'L' is

(A) Cl^- (B) NH_2^- (C) SH^- (D) NO_2^-

Q.3 Magnetic moment (spin only) in B.M. unit is maximum for $[M(NH_3)_6]^{2+}$ when M^{2+} is -

(A) Cr^{2+} (B) V^{2+} (C) Mn^{2+} (D) Ni^{2+}

Q.4 Colour of following three complexes may be in order of -

(i) $CoCl_3.6NH_3$ (ii) $CoCl_3.5NH_3$ (iii) $CoCl_3.4NH_3$

(A) violet, yellow, green (B) yellow, orange, violet

(C) green , yellow, orange (D) yellow, green, red

Q.5 Three different solution were prepared by dissolving same amount (x gm) of the following complexes I, II, III in water.

I - $[Co(NH_3)_3(NO_2)_3]$

II - $[Co(NH_3)_5NO_2]\ [Co(NH_3)_2(NO_2)_4]_2$

III - $[Co(NH_3)_4(NO_2)_2]\ [Co(NH_3)_2(NO_2)_4]$

Then find the order of freezing points of these three solution is -

(A) I > II > III (B) II > III > I (C) III > II > I (D) I = II = III

Q.6 Find the **incorrect** statement regarding complex compound -

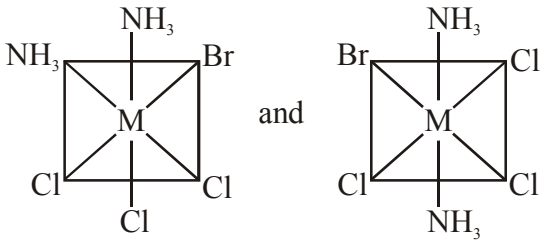
(A) They retain their identity in aq.solution

(B) These compounds are addition compounds.

(C) Generally these compounds show conductivity due to the presence of free central metal ion.

(D) switzers salt is a complex compound

Q.7 Find the correct statements regarding these two complex -



(I) (II)

(A) (I) and (II) are G.I. of each other and both are optically active

(B) (I) and (II) are G.I. of each other and I is optically active while B is optically inactive

(C) (I) and (II) are G.I. of each other and both are optically inactive

(D) (I) and (II) are identical and both are optically inactive.

Q.8 Two normal salts 'X' and 'Y' are mixed together to form a double salt 'Z' [Then aq. solution of double salt 'Z' will show conductivity] (It is assumed that condition is so ideal that conductivity is depending only upon the no. of ions in solution.)

(A) Equal to the conductivity of salt 'X'

(B) Equal to the conductivity of salt 'Y'

(C) Equal to the conductivity addition of salt 'X' and salt 'Y'

(D) Greater than the conductivity addition of salt 'X' and salt 'Y'

Q.9 If three different dilute solutions I, II and III were prepared by dissolving x gm, 2x gm and 3x gram of same complex $[Cr(NH_3)_6]Cl_3$ in water, then find the correct order of conductivity of solution I, II & III

(A) I > II > III (B) III > II > I

(C) I > III > II (D) II = II = III

Q.10 In matte major constituent is -

(A) Cu_2O (B) Cu_2S (C) FeS (D) FeO

Q.11 Which of the following reaction does not occur in the conversion of ZnS to Zn -

(A) $ZnS + 2O_2 \xrightarrow{\Delta} ZnSO_4$ (B) $ZnS + 3/2\ O_2 \xrightarrow{\Delta} ZnO + SO_2$

(C) $2ZnO + ZnS \xrightarrow{\Delta} 3Zn + SO_2$ (D) $ZnO + CO \xrightarrow{\Delta} Zn + CO_2$

Q.12 Self reduction can not be used for the extraction of -

(A) Pb from PbS (B) Hg from HgS

(C) Zn from ZnS (D) Cu from $CuFeS_2$

Q.13 Which of the following element can not be removed in the process softening of lead

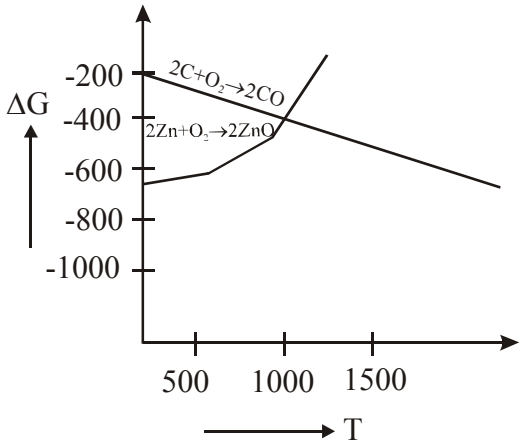
(A) Au (B) Cu (C) As (D) None of these

Q.14 Which of the following step is not to be done for the extraction of Pb from low quality PbS

(A) Froth floatation (B) Roasting

(C) Calcination (D) Carbon reduction

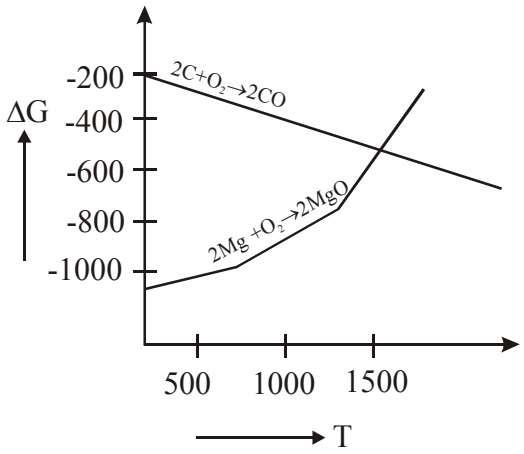
Q.15 By using the graph given below,at what temperature , Zn and carbon have equal affinity for oxygen



(A) 500ºC (B) 1000ºC (C) 1200ºC (D) 1500ºC

Q.16 By using the graph given below, at above 1600ºC temperature ΔG° of this reaction :

$MgO + C \longrightarrow Mg + CO$ is -



(A) Positive (B) Zero (C) Negative (D) Cannot be predicted

Q.17 Which of the following is used as phosphate fertiliser -

(A) Nitrolim (B) Thomas slag (C) Urea (D) Brass

Q.18 Which of the following statement is correct

(A) Roasting process can not be used for sulphide ore

(B) L.D. process used for wrought iron manufacturing

(C) Ores may not be mineral

(D) Sphalerite is the ore of the zinc

Q.19 Which of the following process is not a physical process of benificition

(A) Levigation (B) Magnetic separation

(C) Leaching (D) Froth floatation

Q.20 In the cynide process for the extraction of gold from their native ore sodium cyanide solution act as

(A) leaching agent (B) Reducing agent (C) Oxidizing agent (D) Activator

Q.21 Identify the correct statement

(A) Adsorption phenomenon is used in levigation.

(B) Slag having high m.p. and lighter than molten metal

(C) Van arkel method used for the purification of impure Zr

(D) Cast iron is the purest form of iron.

Q.22 In froth floatation method sodium ethyl xanthate act as -

(A) Activator (B) Depressent (C) Collector (D) None of these

Q.23 Which of the following metal does not form amalgam -

(A) Ag (B) Au (C) Zn (D) Fe

Q.24 The purest form of iron is -

(A) Cementite (B) Wrought iron (C) Pig iron (D) Steel

One or more than may be correct ::

Q.25 The carbon reduction of $ZnSO_4$ produces

(A) Zn (B) ZnS (C) ZnO (D) CO

Q.26 Which of the following is/are the ore of zinc.

(A) Zincite (B) Colemanite (C) Sphalerite (D) Calamine

Q.27 Which of the following processes can be adopted for beneficiation of red bauxite

(A) Hall's process (B) Hoop's process

(C) Serpec's process (D) Baeyer's process

Q.28 By product(s) obtained from blast furnace in the Fe-extraction is/are -

(A) Slag (B) steel (C) Blast furnace gas (D) Pig iron

Q.29 Which of the following mineral(s) is/are used as ore of iron -

(A) Siderite (B) Limonite (C) Haematite (D) Fool's gold

Q.30 Which of the following statement(s) is/are correct -

(A) Froth floatation method can be used for sulphide ore

(B) Tin stone consist of wolframite as magnetic impurity

(C) In cyanide process for the extraction of silver, Zn used as reducing agent

(D) Bessemerization process is used in the extraction of copper from copper pyrite

Q.31 Which of the following step(s) is/are involved in the production of Zn from Zinc blende.

(A) Smelting (B) Calcination (C) Roasting (D) None of these

Q.32 Choose the reaction which indicate slag formation -

(A) $SiO_2 + PbO \xrightarrow{\Delta} PbSiO_3$ (B) $Fe_2O_3 + P_2O_5 \xrightarrow{\Delta} FePO_4$

(C) $FeO + SiO_2 \xrightarrow{\Delta} FeSiO_3$ (D) $CaO + SiO_2 \xrightarrow{\Delta} CaSiO_3$

Q.33 Which of the following statement(s) is/are correct for roasting process -

(A) It is exothermic process (B) Moisture is removed

(C) Sulphur is removed as its elemental vapour (D) Ore becomes porous

Q.34 Which of the following statement is/are correct -

(A) By zone refining process ultra pure Si is obtained

(B) Argentiferous rock is consisting of Ag and FeS_2

(C) Liquation can be applied for Cu, Sn Pb

(D) Scum can be formed in poling method in Cu metallurgy

Q.35 Out of given three complex

(I) $[Mn(CO)_6]^+$ (II) $[Cr(CO)_6]$ (III) $[V(CO)_6]^-$

(A) (III) has maximum C-O length

(B) (II) has lowest O.N. of metal

(C) (I) has minimum number of electrons

(D) (III) has maximum π-character in metal-carbon bond

Q.36 Select complex (s) in which all geometrical isomer of complex are optically active

(A) $[Co(gly)_3]^o$ (B) $[Co(en)(NH_3)(p_y)(Br)(Cl)]^+$

(C) $[Pt(NH_3)(p_y)(Br)(I)]^o$ (D) $[Pt(C_2O_4)_2(NO_2)_2]^{2-}$

Q.37 Identify complex ion of metal in which d-orbitals is/are not involve in hybridisation -

(A) $[Ag(CN)_2]^-$ (B) $[HgI_3]^-$ (C) $[Ni(CN)_4]^{4-}$ (D) $[Ni(Cl)_4]^{2-}$

Q.38 In octahedral complex spherically symmetrical ligand field is assumed then choose the **incorrect** statement(s)

(A) Pairing of electron will occur from t_2g to eg. orbitals in presence of strong field ligand

(B) Pairing of electron will occur from eg to t_2g orbitals in presence of weak field ligand

(C) Pairing of electron will occur from t_2g to eg orbitals in presence of weak field ligand

(D) All the d-orbitals are degenerated

Q.39 Find the correctly matched options based on werner's theory -

Complex :	**Valency :**	**(PV = primary valency)**
(A) $CoCl_3.5NH_3$	PV = 2, SV = 5	**(SV = secondary valency)**
(B) $CoCl_3.6NH_3$	PV = 3, SV = 6	
(C) $CoCl_3.3NH_3$	PV = 1, SV = 6	
(D) $PtCl_4.4NH_3$	PV = 4, SV = 6	

Q.40 For an octahedral complex, with P.E. $\approx$ 0 and d^6 electronic configuration of central metal ion in presence of strong field ligand, find **incorrect** statement(s) regarding crystal field stablisation energy (CFSE) and spiliting energy (Δ_0).

(A) |CFSE| will be equal to spiliting energy Δ_0

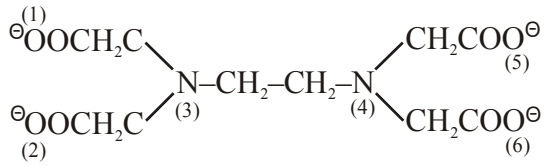
(B) |CFSE| will be greater than spiliting energy Δ_0

(C) |CFSE| will be lesser than spiliting energy Δ_0

(D) Both |CFSE| (stabilisation energy) and spiliting energy (Δ_0) are same for each octahedral complex with any electronic configuration of central metal atom.

Q.41 $[EDTA]^{4-}$ ligands form rings with central metal ion(CMI), when it works as hexadentate ligand, then find the correct statement(s) regarding ring formation -

(17, 2, 3, 4, 5, 6 are no. assigned to donor atom)



(A) 1 and 2 donor atoms form ring with CMI (B) 1 and 3 donor atoms form ring with CMI
(C) 2 and 3 donor atoms form ring with CMI (D) 3 and 6 donor atoms form ring with CMI

Paragraph ::

Paragraph for Q. 42 to Q. 44

The complex compounds which have the same lignads in the co-ordination sphere but the relative position of the ligands around the central atom is different are called as geometrical isomers and this phenomenon is called geometrical isomerism (G.I.)

Q.42 Find the number of geometrical isomer (G.I.) having zero dipole moment for the complex $[MCl_2Br_2]$ (where M^{2+} have $4d^8$ or $5d^8$ configuration)

(A) 2 (B) 0 (C) 1 (D) 3

Q.43 Total numbers of triangular faces in mer $[Ma_3b_3]$ complex which have either two a atom or two b atoms -

(A) 8 (B) 6 (C) two (D) four

Q.44 Select incorrect about fac$[Ma_3b_3]$ complex

(A) It is one of the G.I. of complex which given in above question.

(B) It is optically inactive complex

(C) It has one triangle faces which have three a atoms

(D) None

Paragraph for Q. 45 to Q. 47

When the solutions of certain complex compounds are placed in the path of a plane polarised light, they rotate its plane through a certain angle, which may be either to the left or to the right. Complex having this property (rotating the plane of polarised light) is said to be optically active and this isomerism is called as optical isomerism

Q.45 Number of optical isomer for $Ma_2b_2c_2$ complex -

(A) 3 (B) 2 (C) 0 (D) 1

Q.46 Number of optical isomer for $M(AA)_3$ complex -

(A) 1 (B) 3 (C) 2 (D) 0

Q.47 Number of optical isomers for Ma_4b_2 complex -

(A) 2 (B) 1 (C) 0 (D) 03

Q.48

Column-I **(Complex compound)**	**Column-II** **(Characteristics)**
(A) $[Co(CN)(NH_3)_5]SO_4$	(P) Diamagnetic
(B) $K[Co(CO)_4]$	(Q) O.N. of metal ≤ 0
(C) $K_4[Co(C_2O_4)_3]$	(R) Metal -Metal bond
(D) $Co_2(CO)_8$	(S) Paramagnetic
	(T) Optically active

Q.49

Column-I **(Complex compound)**	**Column-II** **(Characteristics)**
(A) $[CoCl_2Br_2]^{-2}$	(P) No Geometrical isomer
(B) $[Rh(en)_3]^{3+}$	(Q) No Optical isomer
(C) $[Cr(en)_2Br_2]^{+}$	(R) Two optically active form
(D) $[Pt(gly)ClBr]^{-1}$	(S) Chelating complex
	(T) +2 O.N. of metal

Integer ::

Q.50 For the complex $[Co(NH_3)_6]$ $[Fe(CN)_6]$ find the sum of the oxidation states of central metal ions.

Q.51 Find the number of correctly matched complex compounds given below -

(a) $[Co(NH_3)_6]Cl_3$ - hexaamminecobalt(III) chlorido

(b) $K_3[Co(Cl)_6]$ - tripotassium hexachloridocobaltate(III) ion.

(c) $[Cr(C_6H_6)_2]$ - bis(benzene)chromium(0)

(d) $K_2[Fe(CN)_5 \overset{+}{N}O]$ - potassium pentacynonitrosylferrate(III)

Q.52 Find the no. of isoelectronic monodentate ligands given below -

CN^-, H_2O, CO, PH_3, $NO^{\oplus}$, CH_3O^-

Q.53 On the basis of CFT find the no. of correct statements given below -

(a) Spiliting energy in complex of CN = 4 is always greater than spiliting energy of complex with CN = 6

(b) Octahedral complex $[MCl_6]^{4-}$ is more stable than tetrahedral complexe $[MCl_4]^{2-}$

(c) Spiliting energy in octahedral complex is less than that of spiliting energy of tetrahedral complex

(d) Increasing the oxidation number magnitude of CFSE Δ_0 is increases.

Q.54 Find the difference of geometrical isomers of $[Pt(gly)Cl_2]^{\circ}$ and $[Zn(gly)(NH_3)(Cl)]^{\circ}$

Q.55 Find the sum of the magnitude of x & y in the mononuclear anionic species $[Fe(CO)_x]^{-y}$

Q.56 Find the number of ligands which form more than one ring with a central metal ion.

en, $(Gly)^{-}$, $(OX)^{2-}$, $[EDTA]^{4-}$, trien, CO_3^{2-}, dien

Q.57 Find the number(s) of ore of Fe from the following

(a) Chalcopyrite (b) Azurite (c) Epsom salt

(d) Siderite (e) Tincal (f) Magnetite

Q.58. Identify the number(s) of following process which are associated with the extraction of blister copper from chalcopyrite.

Levigation, Smelting, Roasting, Bessemerization, Electrolytic refining, poling, cupelletion.

Q.59. Find the number(s) of ore of Ag from the following :

Argentite, Fluorspar, Hornsilver , lunar caustic, sylvine, german silver

ANSKEY-INORGANIC CHEMISTRRY

Q.1	(D)	Q.2	(D)	Q.3	(C)	Q.4	(B)
Q.5	(D)	Q.6	(C)	Q.7	(C)	Q.8	(C)
Q.9	(B)	Q.10	(B)	Q.11	(C)	Q.12	(C)
Q.13	(A)	Q.14	(C)	Q.15	(B)	Q.16	(C)
Q.17	(B)	Q.18	(D)	Q.19	(C)	Q.20	(A)
Q.21	(C)	Q.22	(C)	Q.23	(D)	Q.24	(B)
Q.25	(B, D)	Q.26	(A, C, D)	Q.27	(A,D)	Q.28	(A,C)
Q.29	(A,B,C)	Q.30	(A,B,C,D)	Q.31	(A,C)	Q.32	(A,B,C,D)
Q.33	(A,B,D)	Q.34	(A,D)	Q.35	(A,D)	Q.36	(A,B)
Q.37	(A,B,C,D)	Q.38	(A,B,C)	Q.39	(B,D)	Q.40	(A,C,D)
Q.41	(B,C)	Q.42	(C)	Q.43	(A)	Q.44	(D)
Q.45	(B)	Q.46	(C)	Q. 47	(C)		

Q.48 **(A) -P ; (B) - P,Q ; (C) - S, T ; (D) - P, Q, R**

Q.49 **(A) -P,Q, T ; (B) - P,R,S ; (C) - R, S ; (D) - Q,S,T**

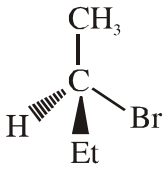
Q.50	(6)	Q.51	(2)	Q.52	(3)	Q.53	(2)
Q.54	(0)	Q.55	(6)	Q.56	(3)	Q.57	(2)
Q.58	(3)	Q.59	(3)				

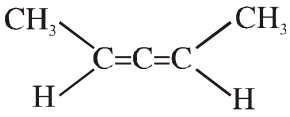
ORGANIC CHEMISTRY

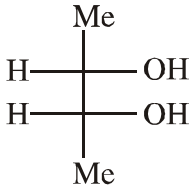
Complete isomerism, Carbanion, Name reaction

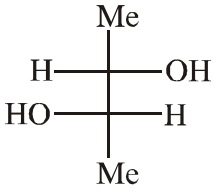
Only one correct ::

1. Identify assymetric compound

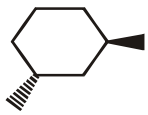
(A) 

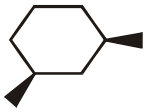
(B) 

(C) 

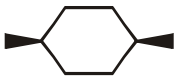
(D) 

2. Which of the following compound is achiral but can show optical isomerism.

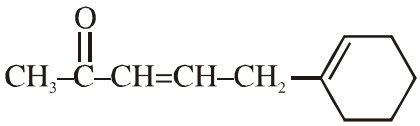
(A) 

(B) 

(C) 

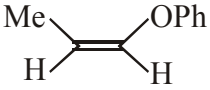
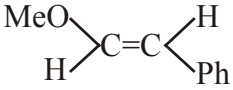
(D) 

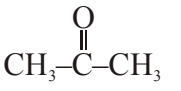
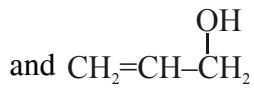
3. Number of H replaced when given compound is treated with $OD^{\ominus}/D_2O$ for a long time.



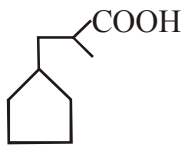
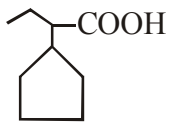
(A) 5 (B) 6 (C) 9 (D) 8

4. Select correct statement :-

(A)  and  are metamers

(B)  and  are tautomers

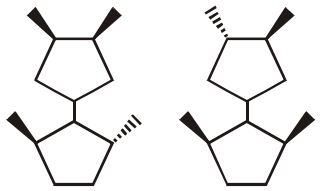
(C)  and  are geometrical isomers

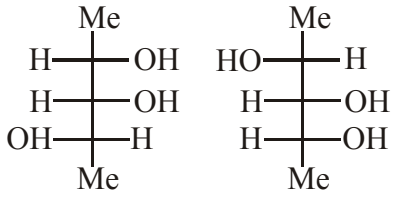
(D)  and  are positional isomers

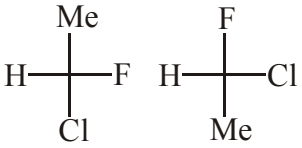
5. 4 gm of (+)-2-chlorobutane is mixed with 6 gm of (–)2 chlorobutane . What will be the optical purity of the obtained mixture.

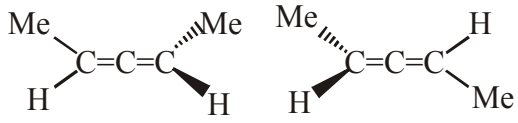
(A) 10% (B) 20% (C) 30% (D) 40%

6. Which of the following represent distereoisomeric pair -

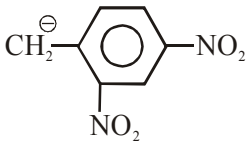
(A) 

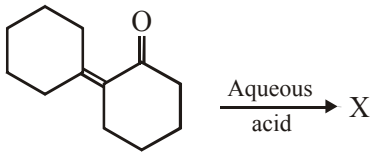
(B) 

(C) 

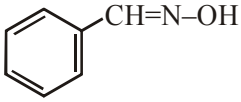
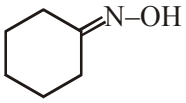
(D) 

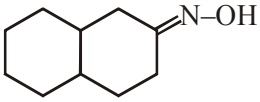
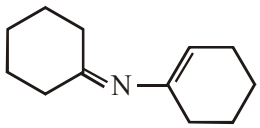
7. Which carbanion is stable due pπ-pπ bonding :-

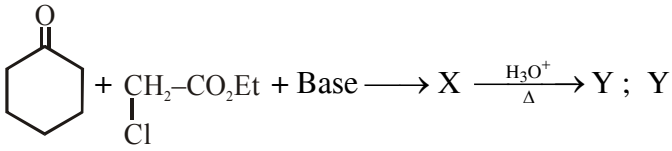
(A)  (B) $Ph_3\overset{\oplus}{P}-\overset{\oplus}{C}H_2$ (C) $RS-\overset{\ominus}{C}H-SR$ (D) $CH_3C\equiv\overset{\ominus}{C}$

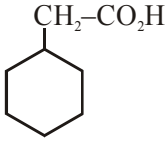
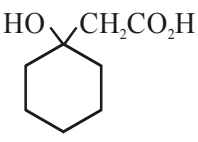
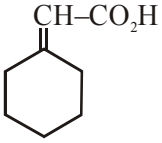
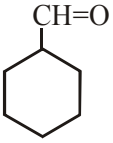
8. 

$X + NH_2OH \rightarrow Y$; Y is :-

(A)  (B) 

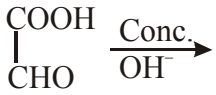
(C)  (D) 

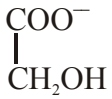
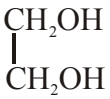
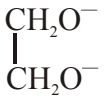
9. 

(A)  (B)  (C)  (D) 

One or more than may be correct ::

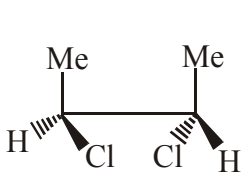
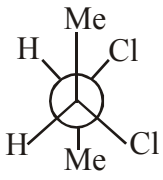
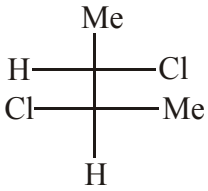
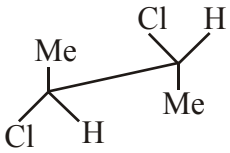
10. Major product of the reaction :



(A) 
(B) 
(C) 
(4) 

Paragraph for Q.11 to Q.12

Analyse the following compounds and answer the given question.


(I)

(II)

(III)

(IV)

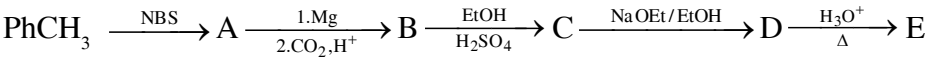
11. Select correct statement about the given compounds -

(A) I & II are enantiomer
(B) I & III are diastereomer
(C) I & IV are identical
(D) II & III are enantiomer

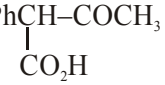
12. If compound (I) rotates the plane of plane polarised light by +32°, then what will be the angle of rotation for compound (III)

(A) +32°
(B) –32°
(C) 0°
(D) None of these

Paragraph for Q.13 to Q.15



13. E is :-

(A) $PhCH_2CO_2H$
(B) $PhCH_2–COCH_3$
(C) 
(D) 

14. Preparation of D from C is an example of :-

(A) Aldol condensation
(B) Claisen condensation
(C) Perkin reaction
(4) Esterification

15. B is :-

(A) Benzoic Acid
(B) Acetyl Benzoic acid
(C) Phenyl acetic acid
(D) Benzyl acetic acid

Paragraph for Q.16 to Q.17

$$Br{-}CH_2{-}CO_2Et + Me_2CH{-}CH_2CH{=}O \xrightarrow{Zn} A \xrightarrow[CrO_3]{} B \xrightarrow[CH_2OH,dryHCl]{CH_2-OH} C \xrightarrow{LiAlH_4} D \xrightarrow[H_3O^+]{} E$$

16. A is :-

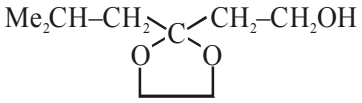
(A) $Me_2CH{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}CH_2{-}CH_2CO_2Et$

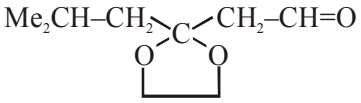
(B) $Me_2CH{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}CH_2CO_2Et$

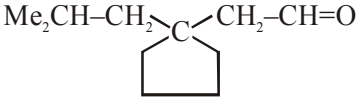
(C) $Me_2CH{-}CH_2{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}CH_2CO_2Et$

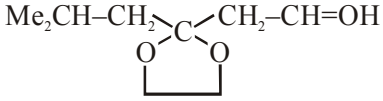
(D) $Me_2CH{-}CH_2{-}\underset{\displaystyle OH}{\underset{|}{CH}}{-}CO_2Et$

17. D is :-

(A) 

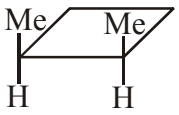
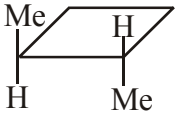
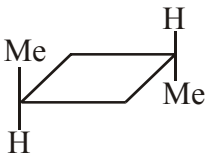
(B) 

(C) 

(D) 

Match the column ::

18. Match the column :-

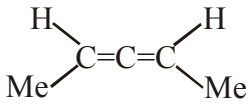
	Column-I		**Column-I**
(A)		(P)	Plane of symmetry
(B)		(Q)	Centre of symmetry
(C)		(R)	Axis of symmetry
(D)	Gauche form of n-butane across C_2–C_3 bond	(S)	Chiral
		(T)	Can show geometrical isomerism

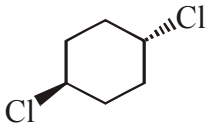
Integer ::

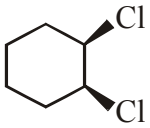
19. How many planes of symmetry is/are present in CD_4 ?

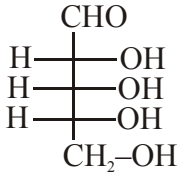
20. Calculate observed angle of rotation (in degrees) of a mixture containing 35% ℓ form & 65% d form of an optically active compound with specific angle of rotation 20°.

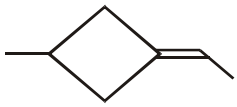
21. How many compounds from the following are optically active.

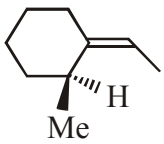
(a) 

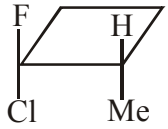
(b) 

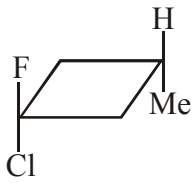
(c) 

(d) 

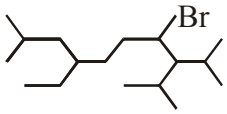
(e) 

(f) 

(g) 

(h) 

22. Calculate the no. of stereoisomers for.



23. Total number of structural isomers possible for $C_2H_2FClBrI$.

24. Total number of isomeric primary alcohols possible for molecular formula : $C_5H_{12}O$.

25. $R-\underset{\underset{O}{\|}}{C}-R \rightarrow RCH_2R$

Identify number of reagents that can be used for above conversion :-

(a) Zn(Hg) + conc. HCl (b) $CHCl_3$ + NaOH (c) $LiAlH_4$ (d) $NaBH_4$

(e) $N_2H_4 + \bar{O}H$ (f) SeO_2 (g) MnO_2 (h) $\begin{matrix}CH_2SH\\|\\CH_2SH\end{matrix}$, H_2 (Raney Ni)

ANSKEY-ORGANIC CHEMISTRRY

Q.1	(A)	Q.2	(B)	Q.3	(C)	Q.4	(A)
Q.5	(B)	Q.6	(A)	Q.7	(A)	Q.8	(B)
Q.9	(C)	Q.10	(A,B)	Q.11	(B)	Q.12	(C)
Q.13	(D)	Q.14	(B)	Q.15	(C)	Q.16	(A)
Q.17	(A)	Q.18	(A) -P,T ; (B) -R,S,T (C) -P,Q,R,T ; (D) -R,S				
Q.19	(6)	Q.20	(6)	Q.21	(5)	Q.22	(4)
Q.23	(7)	Q.24	(5)	Q.25	(3)		

Important Notes