KEY ANSWERS

1	**A**	16	**C**	31	**A**	46	**A & C**
2	**D**	17	**C**	32	**A**	47	**C**
3	**D**	18	**B**	33	**B**	48	**B**
4	**A**	19	**B**	34	**C**	49	**C**
5	**C**	20	**D**	35	**B**	50	**B**
6	**A**	21	**C**	36	**B**	51	**B**
7	**B**	22	**D**	37	**D**	52	**D**
8	**D**	23	**B**	38	**C**	53	**C**
9	**D**	24	**A**	39	**C**	54	**A**
10	**D**	25	**A**	40	*	55	**D**
11	**A**	26	**C**	41	**A**	56	**B**
12	**D**	27	**B**	42	**D**	57	**B**
13	**D**	28	**D**	43	**B**	58	**D**
14	**C**	29	**D**	44	**B & D**	59	**C**
15	**D**	30	**B**	45	**C**	60	**D**

*** : GRACE**

1. In the reaction between moist SO_2 and acidified permanganate solution :

   A) SO_2 is oxidised to SO_4^{2-}

   MnO_4^- is reduced to Mn^{2+}

   B) SO_2 is reduced to S

   MnO_4^- is oxidised to MnO_4

   C) SO_2 is oxidised to SO_3^{-2}

   MnO_4^- is reduced to MnO_2

   D) SO_2 is reduced to H_2S

   MnO_4^- is oxidised to MnO_4 **Ans. (A)**

   Solution: $2MnO_4^- + 2H_2O + 5SO_2 \rightarrow 2Mn^{2+} + 5SO_4^{-2} + 4H^+$

2. Which one of the following properties is generally ***not*** applicable to ionic hydrides ?

   (A) Non-volatile (B) Non-conducting in solid state

   (C) Crystalline D) Volatile **Ans. (D)**

3. Which one of the following nitrate will decompose to give NO_2 on heating?

   (A) $NaNO_3$ (B) KNO_3 (C) $RbNO_3$ C) $LiNO_3$ **Ans. (D)**

   Solution: $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

4. Which of the following halides ***cannot*** be hydrolysed?

   A) CCl_4 (B) $SiCl_4$ (C) $GeCl_4$ (D) $SnCl_4$ **Ans. (A)**

   Solution: Absence of d-orbitals in CCl_4

5. In the analysis of III group basic radicals of salts, the purpose of adding $NH_4Cl_{(s)}$ to NH_4OH is:

   A) to increase the concentration of OH^- ions.

   B) to precipitate the radicals of group IV and V.

   C) to suppress the dissociation of NH_4OH.

   D) to introduce Cl^- ions. **Ans. (C)**

6. Solubility product of CaC_2O_4 at a given temperature in pure water is 4×10^{-9} $(mol\ L^{-1})^2$. Solubility of CaC_2O_4 at the same temperature is

A) 6.3×10^{-5} mol L^{-1} (B) 2×10^{-5} mol L^{-1}

C) 2×10^{-4} mol L^{-1} (D) 6.3×10^{-4} mol L^{-1} **Ans. (A)**

Solution: $K_{sp} = S^2 \quad \Rightarrow 40 \times 10^{-10} = S^2 \quad \Rightarrow S = 6.3 \times 10^{-5}$ mol L^{-1}

7. For the reaction $PCl_5 \rightarrow PCl_3 + Cl_2$, rate and rate constant are 1.02×10^{-4} mol L^{-1} s^{-1} and $3.4 \times 10^{-5} s^{-1}$ respectively at a given instant. The molar concentration of PCl_5 at that instant is :

A) 8.0 mol L^{-1} B) 3.0 mol L^{-1} C) 0.2 mol L^{-1} D) 2.0 mol L^{-1} **Ans. (B)**

Solution : rate = k $[PCl_5]^x$. Where x = 1

8. Which one of the following does not represent Arrhenius equation?

A) $\log k = \log A - \dfrac{Ea}{2.303\ RT}$ B) $k = A\ e^{-Ea/RT}$

C) $\ln k = -\dfrac{Ea}{RT} + \ln A$ D) $k = A\ e^{Ea/RT}$ **Ans. (D)**

9. Identify the incorrect statement:

A) Values of colligative properties of colloidal solution are of small order compared to values of true solution

B) Tyndall effect is observed only when diameter of the dispersed particles is not much smaller than wavelength of incident light.

C) Colour of colloidal solution depends on the wavelength of light scattered by the dispersed particles.

D) Brownian movement is due to balanced bombardment of molecules of dispersion medium on colloidal particles. **Ans. (D)**

Solution: Unbalanced bombardment of molecules of dispersion medium on colloidal particles.

10. For the coagulation of positively charged hydrated ferric-oxide sol, the flocculating power of the ions is in the order :

A) $PO_4^{3-} > SO_4^{2-} > Cl^- > [Fe(CN)_6]^{4-}$ B) $Cl^- > SO_4^{2-} > PO_4^{3-} > [Fe(CN)_6]^{4-}$

C) $SO_4^{2-} = Cl^- = PO_4^{3-} = [Fe(CN)_6]^{4-}$ D) $[Fe(CN)_6]^{4-} > PO_4^{3-} > SO_4^{2-} > Cl^-$ **Ans. (D)**

Solution: Larger the valency greater the flocculating power.

11. Gold **sol is not a:**

(A) Macromolecujar colloid (B) Lyophobic colloid

(C) Multimolecular colloid D) Negatively charged colloid **Ans. (A)**

12. The **incorrect** statement about Hall-Heroult process is:

A) Carbon anode is oxidised to CO and CO_2.

B) Na_3AlF_6 helps to decrease the melting point of the electrolyte.

C) CaF_2 helps to increase the conductivity of the e1ectrolyte

D) Oxidation state of oxygen changes in the overall cell reaction. **Ans. (D)**

13. Select the correct statement:

A) Roasting involves heating the ore in the absence of air.

(B) Calcination involves heating the ore above its melting point.

(C) Smelting involves heating the ore with suitable reducing agent and flux below its melting point.

(D) Calcination of alcium carbonate is endothermic. **Ans. (D)**

14. NO_2 gas is:

(A) Colourless, neutral (B) Colourless, acidic

C) Brown, acidic (D) Brown, neutral **Ans. (C)**

15. Identify the **incorrect** statement from the following:

A) Oxides of nitrogen in the atmosphere can cause depletion of the ozone layer.

B) Ozone absorbs the intense ultraviolet radiation of Sun.

C) Depletion of ozone layer is because of its chemical reactions with chiorofluoro alkanes.

D) Ozone absorbs infrared radiation. **Ans. (D)**

16. The correct decreasing order of boiling point of hydrogen halides is:

A) HF > HCl > HBr > HI B) HI > BHr > HCl > HF

C) HF > HI > HBr > HCl D) HI > HF > HBr > HCl **Ans. (C)**

17. The synthetically produced radioactive noble gas by the collision of $^{249}_{98}Cf$ with $^{48}_{20}Ca$ is :

A) Radon B) Radium C) Oganesson D) Xenon **Ans. (C)**

18. The transition element (≈ 5%) present with lanthanoid metal in Misch metal is :

A) Mg B) Fe C) Zn D) Co **Ans. (B)**

19. Match the following :

I. Zn^{2+}	i. d^8 configuration
II. Cu^{2+}	ii. Colourless
III. Ni^{2+}	iii. μ = 1.73 BM

Codes :

	I	II	III
A)	i	ii	iii
B)	ii	iii	i
C)	ii	i	iii
D)	i	iii	ii

Ans. (B)

20. Which of the following statements related to lanthanoids is incorrect ?

A) Lanthanoids are silvery white soft metals

B) Samarium shows + 2 oxidation state

C) Ce^{+4} solutions are sidely used as oxidizing agents in titrimetric analysis

D) Colour of Lanthanoid ion in solution is due to d-d transition. **Ans. (D)**

21. On treating 100 mL of 0.1 M aqueous solution of the complex $CrCl_3.6H_2O$ with excess of $AgNO_3$, 2.86 g of AgCl was obtained. The complex is:

(A) $[Cr(H_2O)_3.C1_31.3H_2O$ (B) $[Cr(H_2O)_4C1_2]Cl.2H_2O$

C) $[Cr(H_2O)_5Cl]C1_2.H_2O$ (D) $[Cr(H_2O)_6C1_3]$ **Ans. (C)**

Solution: Number of moles of complex $CrCl_3.6H_2O = \frac{100\times0.1}{1000} = 10^{-2}$

Number of moles of complex AgCl = $\frac{2.86}{143.5} = 10^{-2}$ this indicates 2 moles of chlorine outside the coordination sphere.

22. The complex compounds $[Co(NH_3)_5SO_4]$ Br and $[Co(NH_3)_5$ Br$]So_4$ are

A) Geometrical isomers B) Geometrical isomers

C) Optical isomers D) Ionisation isomers **Ans. (D)**

23. Which of the following statements are true about $[CoF_6]^{3-}$ ion?

I. The complex has octahedral geometry.

II. Coordination number of Co is 3 and oxidation state is + 6.

III. The complex is sp^3d^2 hybridised

IV. It is a high spin complex.

(A) I, II and IV B) I, III and IV (C) II and IV (D) II, III and IV **Ans. (B)**

24. A haloalkane undergoes S_N2 or S_N1 reaction depending on:

A) Solvent used in the reaction

B) Low temperature

C) The type of halogen atom

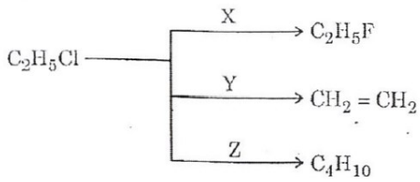
D) Stability of the haloalkane **Ans. (A)**

25. 2-Methyl propane can be prepared by Wurtz reaction. The haloalkanes taken along with mettallic sodium and dry ether are:

A) chloromethane and 2-chloropropane B) chloroethane and chloromethane

C) chloroethane and 1-chloropropane D) chloromethane and 1-chloropropane **Ans. (A)**

26. In the following scheme of reaction,



X, *Y* and Z respectively are

A) AgF, alcoholic KOH and benzene

B) HF, aqueous KOH and Na in dry ether

C) Hg_2F_2, alcoholic KOH and Na in dry ether

C) CoF_2, aqueous KOH and benzene **Ans. (C)**

27. 8.8 g of monohydric alcohol added to ethyl magnesium iodide in ether liberates 2240 cm^3 of ethane at STP. This monohydric alcohol when oxidised using pyridinium-chloropchromate, forms a carbonyl compound that answers silver mirror test (Tollens' test). The monohydric alcohol is:

A) butan-2-ol B) 2, 2-dimethyl propan-1-ol

(C) pentan-2-ol (D) 2, 2-dimethyl ethan-1-ol **Ans. (B)**

Solution:

Mass	**Volume at STP**
8.8 g	2240 cm^3
x	22400 cm^3

Where x = 88 g

28. When a tertiary alcohol 'A' ($C_4H_{10}O$) reacts with 20% H_3PO_4 at 358 K, it gives a compound 'B' (C_4H_8) as a major product. The IUPAC name of the compound 'B' is:

(A) But-1-ene (B) But-2-ene (C) Cyclobutane D) 2-Methylpropene **Ans. (D)**

29. PCC is :

A) $K_2Cr_2O_7$ + Pyridine.

B) $CrO_3 + CHCl_3$

C) $CrO_3 + H_2SO_4$

D) A complex of chromium trioxide with pyridine + HCl **Ans. (D)**

30. Propanone and Propanal are

A) Position isomers B) Functional isomers

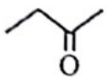
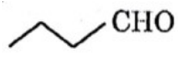
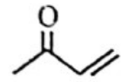
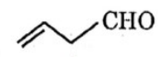
(C) Chain isomers (D) Geometrical isomers **Ans. (B)**

31. Sodium ethanoate on heating with soda lime gives X. Electrolysis of aqueous solution of sodium ethanoate gives 'Y'. 'X' and 'Y' respectively are

A) Methane and Ethane (B) Methane and Methane

(C) Ethane and Methane (D) Ethane and Ethane **Ans. (A)**

32. But- 1-viie on reaction with dil. H_2SO_4 in presence of Hg^{2+} ions at 333 K gives:

A)  B)  C)  D)  **Ans. (A)**

33. Biologically active adrenaline and ephedrine used to increase blood pressure contain:

A) Primary amino group B) Secondary amino group

C) Tertiary amino group (D) Quaternary ammonium salt **Ans. (B)**

34. In the reaction

Anilne $\xrightarrow[\text{dil.HCl}]{NaNO_2}$ P $\xrightarrow[NaOH]{\text{Phenol}}$ Q

Q is :

(A) $C_6H_5N_2Cl$ (B) ortho-hydroxyazobenzene

C) para-hydroxyazobenzene (D) meta-hydroxyazobenzene **Ans. (C)**

35. The female sex hormone which is responsible for the development of secondary female characteristics and participates in the control of menstrual cycle is

(A) Testosterone B)Eradiol (C) Insulin (D) Thyroxine **Ans. (B)**

36. The type of linkage present between nucleotides is

(A) Phosphoester linkage B) Phosphodiester linkage

(C) Amide linkage (D) Glycosidic linkage **Ans. (B)**

37. α -D - (+) - glucose and β – D - (+) - glucose are:

(A) Enantomers (B) Conformers (C) Epimers D)Anomers **Ans. (D)**

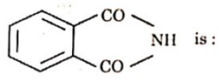
38. Which of the following set of polymers are used as fibre ?

(i) Teflon (ii) Starch (iii) Terylene (iv) Orlon

(A) (i) and (ii) B) (ii) and (iii) C) (iii) and (iv) (D) (i) and (iv) **Ans. (C)**

39. The biodegradable polymer obtained by polymerisation of Glycine and Aminocaproic acid is :

(A) Nylon 6 B) PHBV C) Nylon 6 D) Nylon 6, 10 **Ans. (C)**

40. The compound  is :

A) Sucralose B) Aspartame (C) Saccharin (D) Alitame **Ans. (*)**

41. Which one of the following is a cationic detergent?

A) Cetyltrimethylammonium bromide B) Sodium dodecylbenzene suiphonate

C) Dodecylbenzene suiphonic acid D) Dodecylbenzene **Ans. (A)**

42. For which one of the following mixtures is composition uniform throughout?

A) Sand and water

B) Grains and pulses with stone

C) Mixture of oil and water

D) Dilute aqueous solution of sugar **Ans. (D)**

43. The energy associated with first orbit of He^+ is:

(A) 0 J (B) -8.72×10^{-18}J (C) -4.58×10^{-18} D) -0.545×10^{-18} J **Ans. (B)**

Solution: $E_n = -2.18\times10^{-18}\,J \times \frac{Z^2}{n^2} = -2.18\times10^{-18}\,J \times \frac{2^2}{1^2}$

44. A metalloid is:

A) Bi B) Sb (C) P (D) Se **Ans. (B)&(D)**

45. A pair of isoelectronic species having bond order of one is:

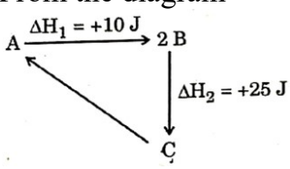
(A) N_2 CO (B) N_2, NO^+ C) O_2^{2-}, F_2 (D) CO, NO^+ **Ans. (C)**

46. Identify the **wrong** relation for real gases:

A) $Z = \frac{V_{ideal}}{V_{real}}$ B) $p_{ideal} = p_{real} + \frac{an^2}{V^2}$

(C) $V_{real} = V_{ideal} - nb$ (D) $\left(p + \frac{a}{V^2}\right)(V - b) = RT$ **Ans. (A) & (C)**

47. From the diagram



$\Delta_r H$ for the reaction C $\rightarrow$ A is:

(A) +35J (B) – 15J C) – 35J (D) + 15 J **Ans. (C)**

48. Vapour pressure of a solution containing 18 g of glucose and 178.2 g of water at l00°C is .

(Vapour pressure of pure water at 100°C = 760 torr)

(A) 760 torr B) 752.4 torr (C) 7.6 torr (D) 3207.6 torr **Ans. (B)**

Solution: $\frac{p^0 - p}{p^0} = \frac{w_2 / M_2}{w_1 / M_1} \Rightarrow \frac{760 - p}{760} = \frac{0.1}{10}$

49. A mixture of phenol and aniline shows negative deviation from Raouilt's law. This is due to the formation of:

(A) Polar covalent bond (B) Non-polar covalent bond

C) Intermolecular Hydrogen bond (D) intramolecuthr Hydrogen bond **Ans. (C)**

50. Which one of the following pairs will show positive deviation from Raoult'S Law?

(A) Water - HCl B) Benzene - Methanol

(C) Water-HNO_3 (D) Acetone – Chloroform **Ans. (B)**

51. How many Coulombs are required to oxidise 0.1 mole of H_2O to oxygen?

A) 1.93×10^5 C B) 1.93×10^4 C C) 3.86×10^4 C D) 965×10^3 C **Ans. (B)**

Solution: 1 mole – 2×96500 C

0.1 - ?

= 19300 C

52. A current of 3 A is passed through a molten calcium salt for 1 hr 47 min 13 sec. The mass of calcium deposited is (Molar mass of Ca = 40 g mol^{-1})

(A) 6.0 g (B) 2.0 g C) 8.0 D) 4.0 g **Ans. (D)**

Solution: $W = Z \times I \times t$

53. The value of 'A' in the equation $\lambda_m = \lambda_m^o - A\sqrt{C}$ is same for the pair

A) NaCl and $CaCl_2$ B)$CaC1_2$ and $MgSO_4$ C)NaCl and KBr D)$MgCl_2$ and NaCl **Ans. (C)**

54. For the reaction, A $\rightleftharpoons$ B, E_a= 50 kJ mo1^{-1} and $\Delta H = -20$ kJ mol^{-1}. When a catalyst is added, E_a decreases by 10 kJ mol^{-1}. What is the E_a for the backward reaction in the presence of catalyst?

A) 60 kJ mol^{-1} B) 40 kJ mol^{-1} C) 70 kJ mol^{-1} D) 20 kJ mol^{-1} **Ans. (A)**

55. The first chlorinated organic insecticide prepared is :

(A) Gammexane (B) Chloroform C) $COCl_2$ D) DDT **Ans. (D)**

56. Which of the following crystals has the unit cell such that a = b ≠ c and $\alpha = \beta = 90°$, $\gamma = 120°$?

(A) Zinc blende B) Graphite

(C) Cinnabar (D) Potassium dichromate **Ans. (B)**

57. MnO exhibits:

(A) Ferrimagnetism B) Antiferromagnetism

C) Ferromagnetism D) Paramagnetism **Ans. (B)**

58. The number of atoms in 4.5 g of a face-centred cubic-crystal with edge length 300 pm is:

(Given density = 10 g cm^{-3} and $N_A = 6.022 \times 10^{23}$)

(A) 6.6×10^20 (B) 6.6×10^{23} (C) 6.6×10^{19} D) 6.6×10^{22} **Ans. (D)**

Solution: $d = \frac{Z \times M}{a^3 \times N_A}$ where z = 4

59. 0.48g of an organic compound on complete combustion produced 0.22 g of CO_2. The percentage of C in the given organic compound is

(A) 25 (B) 50 C) 12.5 (D) 87.5 **Ans. (C)**

60. In the given sequence of reactions, identify P', 'Q', 'R' and 'S' respectively.

$$CH_2 = CH_2 \xrightarrow{P} \underset{\underset{Br}{|}}{CH_2} - \underset{\underset{Br}{|}}{CH_2} \xrightarrow{Q} CH_2 = CH - Br \xrightarrow{R} CH \equiv CH \xrightarrow{S} C_6H_6$$

A) Br_2, Ale. KOH, NaOH, Al_2O.

B) HBr, Alc. KOH, CaC_2, $KMnO_4$

C) HBr, Alc. KOH, $NaNH_2$, Red hot iron tube

D) Br_2, Alc. KOR, $NaNH_2$, Red hot iron tube **Ans. (D)**