1. Which of the following is a redox reaction ?
(a) $NaCl + KNO_3 \longrightarrow NaNO_3 + KCl$
(b) $CaC_2O_4 + 2HCl \longrightarrow CaCl_2 + H_2C_2O_4$
(c) $Ca(OH)_2 + 2NH_4Cl \longrightarrow CaCl_2 + 2NH_3 + 2H_2O$
(d) $2K[Ag(CN)_2] + Zn \longrightarrow 2Ag + K_2[Zn(CN)_4]$

2. For an ideal gas, number of mol per litre in terms of its pressure P, temperature T and gas constant R is :
(a) PT/R (b) PRT
(c) P/RT (d) RT/P

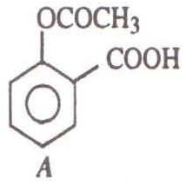
3. Number of P—O bonds in P_4O_{10} is :
(a) 17 (b) 16 (c) 15 (d) 6

4. KO_2 is used in space and submarines because it :
(a) absorbs CO_2 and increases O_2 concentration
(b) absorbs moisture
(c) absorbs CO_2
(d) produces ozone

5. Which of the following ions has the maximum magnetic moment ?
(a) Mn^{2+} (b) Fe^{2+}
(c) Ti^{2+} (d) Cr^{2+}

6. Acetylene does not react with :
(a) Na
(b) ammonical $AgNO_3$
(c) HCl
(d) NaOH

7. Compound A given below is :



A

(a) antiseptic (b) antibiotic
(c) analgesic (d) pesticide

8. For the following cell with hydrogen electrodes at two different pressures p_1 and p_2

$$Pt(H_2) \mid H^+(aq.) \mid Pt(H_2)$$
$$p_1 \quad 1M \quad p_2$$

emf is given by :
(a) $\frac{RT}{F}\log_e\frac{p_1}{p_2}$ (b) $\frac{RT}{2F}\log_e\frac{p_1}{p_2}$
(c) $\frac{RT}{F}\log_e\frac{p_2}{p_1}$ (d) $\frac{RT}{2F}\log_e\frac{p_2}{p_1}$

9. Acetylene reacts with hypochlorous acid to form :
(a) Cl_2CHCHO (b) $ClCH_2COOH$
(c) CH_3COCl (d) $ClCH_2CHO$

10. On heating benzyl amine with chloroform and ethanolic KOH, product obtained is :
(a) benzyl alcohol (b) benzaldehyde
(c) benzonitrile (d) benzyl isocyanide

11. Which of the following reaction is possible at anode ?
(a) $F_2 + 2e^- \longrightarrow 2F^-$
(b) $2H^+ + \frac{1}{2}O_2 + 2e^- \longrightarrow H_2O$
(c) $2Cr_2^{3+} + 7H_2O \longrightarrow Cr_2O_7^{2-} + 14H^+ + 6e^-$
(d) $Fe^{2+} \longrightarrow Fe^{3+} + e^-$

12. Which of the following concentration factor is affected by change in temperature ?
(a) Molarity (b) Molality
(c) Mol fraction (d) Weight fraction

13. Cyanide process is used for the extraction of :
(a) barium (b) silver (c) boron (d) zinc

14. Following reaction
$(CH_3)_3CBr + H_2O \longrightarrow (CH_3)_3COH + HBr$
is an example of :
(a) elimination reaction
(b) free radical substitution
(c) nucleophilic substitution
(d) electrophilic substitution

15. A metal M forms water soluble MSO_4 and inert MO. MO in aqueous solution forms insoluble $M(OH)_2$ soluble in NaOH. Metal M is :
(a) Be (b) Mg (c) Ca (d) Si

16. Half life of a substance *A* following first order kinetics is 5 days. Starting with 100 g of *A*, amount left after 15 days is :
(a) 25 g (b) 50 g (c) 12.5 g (d) 6.25 g

17. The most stable ion is :
(a) $[Fe(OH)_5]^{3-}$ (b) $[FeCl_6]^{3-}$
(c) $[Fe(CN)_6]^{3-}$ (d) $[Fe(H_2O)_6]^{3+}$

18. A substance forms zwitter ion. It can have functional groups :
(a) $-NH_2$, $-COOH$ (b) $-NH_2$, $-SO_3H$
(c) both (d) none of these

19. If Fe^{3+} and Cr^{3+} both are present in group III of qualitative analysis, then distinction can be made by :
(a) addition of NH_4OH in presence of NH_4Cl when only $Fe(OH)_3$ is precipitated
(b) addition of NH_4OH in presence of NH_4Cl when $Cr(OH)_3$ and $Fe(OH)_3$ both are precipitated and on adding Br_2 water and NaOH, $Cr(OH)_3$ dissolves
(c) precipitate of $Cr(OH)_3$ and $Fe(OH)_3$ as obtained in (b) are treated with conc. HCl when only $Fe(OH)_3$ dissolves
(d) (b) and (c) the correct.

20. In an organic compound of molar ma 108 g mol^{-1} C, H and N atoms are prese in 9 : 1 : 3.5 by weight. Molecular formu can be :
(a) $C_6H_8N_2$ (b) $C_7H_{10}N$
(c) $C_5H_6N_3$ (d) $C_4H_{18}N_3$

21. Solubility of $Ca(OH)_2$ is *S* mol litre^{-1}. Tl solubility product (K_{sp}) under the san condition is :
(a) $4S^3$ (b) $3S^4$
(c) $4S^2$ (d) S^3

22. Heat required to raise the temperature of mol of a substance by 1° is called :
(a) specific heat (b) molar heat capac
(c) water equivalent (d) specific gravity

23. β-particle is emitted in a radioactive reactic when :
(a) a proton changes to neutron
(b) a neutron changes to proton
(c) a neutron changes to electron
(d) an electron changes to neutron

24. In a mixture of *A* and *B*, components sho negative deviation when :
(a) *A*—*B* interaction is stronger than *A*— and *B*—*B* interaction
(b) *A*—*B* interaction is weaker than *A*—*A* ar *B*—*B* interaction
(c) $\Delta V_{mix} > 0$, $\Delta S_{mix} > 0$
(d) $\Delta V_{mix} = 0$, $\Delta S_{mix} > 0$

25. Refining of impure copper with zinc impuri is to be done by electrolysis using electro as :

	Cathode	Anode
(a)	pure copper	pure zinc
(b)	pure zinc	pure copper
(c)	pure copper	impure copper
(d)	pure zinc	impure zinc

26. Aluminium is extracted by the electroly of :
(a) alumina
(b) bauxite
(c) molten cryolite
(d) alumina mixed with molten cryolite

27. For an aqueous solution, freezing point is $-0.186°C$. Elevation of the boiling point of the same solution is ($K_f = 1.86°\ mol^{-1}\ kg$ and $K_b = 0.512°\ mol^{-1}\ kg$) :
(a) 0.186° (b) 0.0512°
(c) 1.86° (d) 5.12°

28. Underlined carbon is sp^3 hybridised in :
(a) $CH_3\underline{C}H{=}CH_2$ (b) $CH_3\underline{C}H_2NH_2$
(c) $CH_3\underline{C}ONH_2$ (d) $CH_3CH_2\underline{C}N$

29. Bond angle of 109°28′ is found in :
(a) NH_3 (b) H_2O (c) $\overset{\oplus}{C}H_5$ (d) $\overset{\oplus}{N}H_4$

30. For a reaction $A + 2B \longrightarrow C$, rate is given by $+\frac{d[C]}{dt} = k[A][B]$, hence the order of the reaction is :
(a) 3 (b) 2 (c) 1 (d) 0

31. CH_3MgI is an organometallic compound due to :
(a) Mg—I bond (b) C—I bond
(c) C—Mg bond (d) C—H bond

32. One of the following species acts as both Bronsted acid and base :
(a) $H_2PO_2^-$ (b) HPO_3^{2-}
(c) HPO_4^{2-} (d) all of the above

33. Hybridisation of the underline atom changes in :
(a) $\underline{Al}H_3$ changes to AlH_4^-
(b) $H_2\underline{O}$ changes to H_3O^+
(c) $\underline{N}H_3$ changes to NH_4^+
(d) in all cases

34. Racemic mixture is formed by mixing two :
(a) isomeric compounds
(b) chiral compounds
(c) meso compounds
(d) enantiomers with chiral carbon

35. The number of lone pairs on Xe in XeF_2, XeF_4 and XeF_6 respectively are :
(a) 3, 2, 1 (b) 2, 4, 6
(c) 1, 2, 3 (d) 6, 4, 2

36. An aqueous solution of 1M NaCl and 1M HCl is :
(a) not a buffer but pH < 7
(b) not a buffer but pH > 7
(c) a buffer with pH < 7
(d) a buffer with pH > 7

37. Consider following two reactions

$A \longrightarrow$ Product $\quad -\frac{d[A]}{dt} = k_1[A]^0$

$B \longrightarrow$ Product $\quad -\frac{d[B]}{dt} = k_2[B]$

k_1 and k_2 are expressed in terms of molarity (mol L^{-1}) and time (sec^{-1}) as :
(a) sec^{-1}, $M\ sec^{-1}\ L^{-1}$
(b) $M\ sec^{-1}$, $M\ sec^{-1}$
(c) sec^{-1}, $M^{-1}\ sec^{-1}$
(d) $M\ sec^{-1}$, $L^{-1}\ sec^{-1}$

38. RNA contains :
(a) ribose sugar and thymine
(b) ribose sugar and uracil
(c) deoxyribose sugar and uracil
(d) deoxyribose sugar and thymine

39. For a cell given below :

$$Ag\,|\,Ag^+\ ||\ Cu^{2+}\,|\,Cu$$
$$-\qquad\qquad +$$

$Ag^+ + e^- \longrightarrow Ag \quad E^\circ = x$

$Cu^{2+} + 2e^- \longrightarrow Cu, \quad E^\circ = y$

E° cell is :
(a) $x + 2y$
(b) $2x + y$
(c) $y - x$
(d) $y - 2x$

40. Based on kinetic theory of gases following laws can be proved :
(a) Boyle's law
(b) Charle's law
(c) Avogadro's law
(d) all of these

41. MnO_4^- is a good oxidising agent in different medium changing to

$$MnO_4^- \longrightarrow Mn^{2+}$$
$$\longrightarrow MnO_4^{2-}$$
$$\longrightarrow MnO_2$$
$$\longrightarrow Mn_2O_3$$

Changes in oxidation number respectively are :

(a) 1, 3, 4, 5 (b) 5, 4, 3, 2
(c) 5, 1, 3, 4 (d) 2, 6, 4, 3

42. For the reaction : $H_2 + I_2 \longrightarrow 2HI$, the differential rate law is :

(a) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = 2\frac{d[HI]}{dt}$

(b) $-2\frac{d[H_2]}{dt} = -2\frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$

(c) $-\frac{d[H_2]}{dt} = -\frac{d[I_2]}{dt} = \frac{d[HI]}{dt}$

(d) $-\frac{d[H_2]}{2dt} = -\frac{d[I_2]}{2dt} = \frac{d[HI]}{dt}$

43. Number of atoms in 560 g of Fe (atomic mass 56 g mol^{-1}) is :

(a) is twice that of 70 g N
(b) is half that of 20 g H
(c) both are correct
(d) none is correct

44. Geometrical isomerism is not shown by :

(a) 1, 1–dichloro-1-pentene
(b) 1, 2-dichloro-1-pentene
(c) 1, 3-dichloro-2-pentene
(d) 1, 4-dichloro-2-pentene

45. Number of atoms in the unit cell of Na (BCC type crystal) and Mg (FCC type crystal) are respectively :

(a) 4, 4 (b) 4, 2 (c) 2, 4 (d) 1, 1

46. Which of the following compounds has incorrect IUPAC nomenclature ?

(a) $CH_3CH_2CH_2\overset{O}{\overset{\|}{C}}OC_2H_5$
ethylbutanoate

(b) $CH_3\underset{CH_3}{\underset{|}{C}}HCH_2CHO$
3-methyl butanal

(c) $CH_3\underset{CH_3}{\underset{|}{C}}H\overset{O}{\overset{\|}{C}}CH_2CH_3$
2-methyl-3-pentanone

(d) $CH_3\underset{H_3C}{\underset{|}{C}}H\underset{OH}{\underset{|}{C}}HCH_3$
2-methyl-3-butanol

47. End product of the following reaction is :

$$CH_3CH_2COOH \xrightarrow[\text{red P}]{Cl_2} \xrightarrow{\text{alcoholic KOH}}$$

(a) $CH_3\underset{OH}{\underset{|}{C}}HCOOH$ (b) $CH_2\underset{OH}{\underset{|}{C}}H_2COOH$

(c) $CH_2{=}CHCOOH$ (d) $CH_2\underset{Cl}{\underset{|}{C}}H\underset{OH}{\underset{|}{C}}HCOOH$

48. For the following reaction in gaseous phase

$$CO + \tfrac{1}{2}O_2 \longrightarrow CO_2$$

K_c/K_p is :

(a) $(RT)^{1/2}$ (b) $(RT)^{-1/2}$
(c) (RT) (d) $(RT)^{-1}$

49. Energy of H-atom in the ground state is –13.6 eV, hence energy in the second excited state is :

(a) – 6.8 eV (b) – 3.4 eV
(c) – 1.51 eV (d) – 4.53 eV

50. A square planar complex is formed by hybridisation of the following atomic orbitals :

(a) s, p_x, p_y, p_z
(b) s, p_x, p_y, p_z, d
(c) d, s, p_x, p_y
(d) s, p_x, p_y, p_z, d, d

51. Type of isomerism shown by $[Cr(NH_3)_5NO_2]Cl_2$ is :

(a) optical (b) ionisation
(c) geometrical (d) linkage

52. One of the following equilibria is not affected by change in volume of the flask :

(a) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$
(b) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(c) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
(d) $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$

53. Uncertainty in position of a particle of 25 g in space is 10^{-5}m. Hence uncertainty in velocity (ms^{-1}) is (Planck's constant $h = 6.6 \times 10^{-34}$ Js) :

(a) 2.1×10^{-28} (b) 2.1×10^{-34}
(c) 0.5×10^{-34} (d) 5.0×10^{-24}

54. Consider the following reactions at 1100°C

(I) $2C + O_2 \longrightarrow 2CO$,

$\Delta G° = -460$ kJ mol^{-1}

(II) $2Zn + O_2 \longrightarrow 2ZnO$,

$\Delta G° = -360$ kJ mol^{-1}

Based on these, select correct alternate :

(a) zinc can be oxidised by CO
(b) zinc oxide can be reduced by carbon
(c) both are correct
(d) none is correct

55. A reaction is non-spontaneous at the freezing point of water but is spontaneous at the boiling point of water then :

	ΔH	ΔS
(a)	+ve	+ve
(b)	–ve	–ve
(c)	–ve	+ve
(d)	+ve	–ve

Answer – Key

1. d	2. c	3. b	4. a	5. a	6. d	7. c	8. b	9. a	10. d
11. d	12. a	13. b	14. c	15. a	16. c	17. c	18. c	19. b	20. a
21. a	22. b	23. b	24. a	25. c	26. d	27. b	28. b	29. d	30. b
31. c	32. c	33. a	34. b	35. a	36. a	37. d	38. b	39. c	40. d
41. c	42. b	43. c	44. a	45. c	46. d	47. c	48. a	49. c	50. c
51. b	52. c	53. a	54. b	55. a					