1) Which of the ions will give colourless aqueous solution?
   a) Ni^{2+}  
   b) Fe^{2+}  
   c) Cu^{2+}  
   d) Cu^{+}
2) Which among the following is not attacked by alkalis?
   a) Gold  
   b) Silver  
   c) Copper  
   d) All the above
3) The common oxidation state exhibited by lanthanides is
   a) +2  
   b) +1  
   c) +4  
   d) +3
4) Co-ordination number of Ni(II) in [Ni(CN)_{4}]^{-2} is
   a) 4  
   b) 2  
   c) 5  
   d) 6
5) The percentage of lanthanum in mish metals is
   a) 45-50%  
   b) 5%  
   c) 25%  
   d) 100%
6) Loss of a β-particle is equivalent to
   a) increase of one proton only  
   b) decrease of one neutron only  
   c) both (a) & (b)  
   d) none of these
7) The phenomenon of Tyndall’s effect is not observed in
   a) emulsion  
   b) colloidal solution  
   c) true solution  
   d) none
8) In case of physical adsorption, there is desorption when
   a) temperature increases  
   b) temperature decreases  
   c) pressure increases  
   d) concentration increases
9) Colloidal gold is prepared by
   a) Electro-dispersion method  
   b) ultrasonic dispersion  
   c) reduction  
   d) both (a) and (c)
10) For the titration between oxalic acid and sodium hydroxide, the indicator used is .......
    a) potassium permanganate  
    b) phenolphthalein  
    c) litmus  
    d) methyl orange
11) In nitroalkanes –NO_{2} group is converted to –NH_{2} group by the reaction with
    a) Sn/HCl  
    b) Zn dust  
    c) Zn/NH_{4}Cl  
    d) Zn/NaOH
12) Amiline differs from ethylamine by the reaction with
    a) metallic sodium  
    b) an alkyl halide  
    c) chloroform and caustic potash  
    d) nitrous acid
13) Which among the following is a secondary amine?
    a) dimethyl amine  
    b) ethyl methyl amine  
    c) isopropyl amine  
    d) both a & b
14) Sucrose contains glucose and fructose linked by
    a) C_{1}-C_{1}  
    b) C_{1}-C_{2}  
    c) C_{1}-C_{4}  
    d) C_{1}-C_{6}
15) _____ have been implicated in the process of blood coagulation
    a) glucose  
    b) cephalins  
    c) fructose  
    d) all the above
16) Cuprous oxide is an example of
    a) metallic crystal  
    b) covalent crystal  
    c) AB type ionic crystal  
    d) AB_{2} type of ionic crystal
17) The energy of electron in an atom is given by E_{n} =
    a) \frac{-4\pi^{2}me^{4}}{n^{2}h^{2}}  
    b) \frac{-2\pi^{2}me^{2}}{n^{2}h^{2}}  
    c) \frac{-2\pi^{2}me^{4}}{n^{2}h^{2}}  
    d) \frac{-2\pi me^{4}}{n^{2}h^{2}}
18. Which among the following has least bond length?  
a) $N_2$  
b) $O_2$  
c) $H_2$  
d) None of the above

19. The order of ionization energy  
a) $s$\(\rightarrow\)\(p\rightarrow\)\(d\rightarrow\)\(f\)  
b) $s$\(\rightarrow\)\(p\rightarrow\)\(d\rightarrow\)\(f\)  
c) $s$\(\rightarrow\)\(d\rightarrow\)\(p\rightarrow\)\(f\)  
d) $s$\(\rightarrow\)\(d\rightarrow\)\(p\rightarrow\)\(f\)

20. Which among the following is reducing agent?  
a) $H_3PO_3$  
b) $KMnO_4$  
c) $PH_3$  
d) both (a) & (c)

21. Standard free energy of formation of elementary oxygen is  
a) zero  
b) 21 KJ  
c) 21 K Cal  
d) negative

22. In an adiabatic process which of the following is true?  
a) $q$ = $w$  
b) $q$ = 0  
c) $\Delta E$ = $q$  
d) $P\cdot V$ = 0

23. At 700°C, the equilibrium constant for \(2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)\) is $4.8 \times 10^{-3}$.  
At the same temperature the equilibrium constant for \(2SO_2(g) \rightleftharpoons 2SO_2(g) + O_2(g)\) is  
a) $\frac{1000}{4.8}$  
b) $4.8 \times 10^{-3}$  
c) $9.6 \times 10^{-3}$  
d) $4.8 \times 10^{3}$

24. In the reversible reaction \(2HI \rightleftharpoons H_2 + I_2\), $K_p$ is  
a) greater than $K_C$  
b) less than $K_C$  
c) equal to $K_C$  
d) zero

25. For a reaction $E_a$ = 0 and $K$ = $4.2 \times 10^5$ sec\(^{-1}\) at 300 K, the value of $K$ at 310 K will be  
a) $4.2 \times 10^5$ sec\(^{-1}\)  
b) $8.4 \times 10^5$ sec\(^{-1}\)  
c) $8.4 \times 10^5$ sec\(^{-1}\)  
d) unpredictable

26. The compound that liberates hydrogen with metallic sodium is  
a) ethanol  
b) glycerol  
c) anisole  
d) both (a) & (b)

27. Diethyl ether can be decomposed with  
a) HI  
b) $KMnO_4$  
c) NaOH  
d) $H_2O$

28. When ether is exposed to air for sometime an explosive substance produced is  
a) peroxide  
b) oxide  
c) TNT  
d) superoxide

29. The compound that does not form addition product with sodium bisulphite is  
a) Benzophenone  
b) Acetaldehyde  
c) Acetone  
d) Benzaldehyde

30. The compound found in some stony deposit in kidneys is  
a) potassium oxalate  
b) oxalic acid  
c) potassium succinate  
d) calcium oxalate

**Note:** i) Answer any 15 questions.  
ii) Each answer should be in one or two sentences.  
\[15 \times 3 = 45\]

31. Distinguish particle with wave.
32. Explain the relation between screening effect and electron affinity.
33. $H_3PO_3$ is a dibasic acid. Prove.
34. State the uses of neon.
35. How does copper react with conc. $HNO_3$?
36. How is purple of cassius prepared?
37. How will you study mechanism of hydrolysis of ester by radioactive isotopes?
38. Define super conducting transition temperature?
39. What is standard free energy change?
40. Give the relationship between $K_p$ and $K_C$ for the following reactions:  
a) Formation of HI  
b) Formation of $NH_3$
41. State the characteristics of first order reactions.
42. What are opposing reactions? Give example.
43. What is Brownian movement? What is the reason behind the phenomenon?
44) Enthalpy of neutralisation between strong acids Vs strong bases is always a constant. Why?
45) Give the structures of isomers of tartaric acid.
46) How will you convert ethylene glycol into dioxan?
47) What is Lederer-Manasse reaction?
48) State three compounds which do not undergo aldol condensation?
49) State any three tests for salicylic acid.
51) Write a short notes on buna-S rubber.

Part - III

Note: Answer any seven questions choosing at least two questions from each section: 7x5=35

Section - A

52) Explain molecular orbital theory.
53) How is silver extracted from its chief ore?
54) Compare lanthanides with actinides.
55) How is chlorophyll important in environmental chemistry? Mention its function.

Section - B

56) State the characteristics of entropy.
57) Initially 0.1 moles each of H₂ and I₂ gases and 0.02 moles of HI gas are mixed in a reaction vessel of constant volume at 300 K. Predict the direction towards the reaction proceeds \[ K_c = 3.5 \times 10^{-2} \]
58) Derive the equation for first order rate constant.
59) Explain Daniel cell.

Section - C

60) Explain the electrophilic substitution reactions of anisole.
61) How does NH₃ react with following a] HCHO b] CH₃CHO c] C₆H₅CHO
62) Explain the reaction mechanism of bromination of salicylic acid.
63) Explain the relationship between the colour of a substance and its structure.

Part - IV

Note: Question no. 70 is compulsory and answer any three from the remaining questions: 4x10=40

64) a] Explain any one application of electro negativity.
   b] How is fluorine isolated by Dennis method?
65) a] Write down the postulates of Werner's theory on co-ordination compounds.
   b] Explain the nuclear reactions taking place in sun.
66) a] Write a short notes on glass.
   b] Explain Intermediate compound formation theory.
67) a] Explain buffer action.
   b] List out the IUPAC conventions for writing cell diagrams.
68) a) Describe the isomerism exhibited by 1,3-butadiene.
   b) How will you achieve the following conversions?
      i) Cyanogen into oxalic acid  ii) phenyl cyanide into benzoic acid

69) a) Explain any three reductions of nitrobenzene.
   b) Show the formation of a peptide bond with an equation

70) a) An organic compound 'A' of molecular formula C₃H₈O₃ which is used as
      sweetening agent in beverages gives an unsaturated compound 'B' of
      molecular formula C₃H₄O. Compound 'A' when heated with oxalic acid at
      533 K gives another unsaturated compound 'C' of molecular formula C₃H₆.
      Identify A, B, & C.

      b) A bluish white metal 'A' which is present in 12th group and 4th period on
         treatment with hot conc. H₂SO₄ gives a compound 'B'. Compound 'B' when
         treated with NaHCO₃ gives compound 'C'. Compound 'C' decomposes at
         300°C to give compound 'D' with the evolution of CO₂. Identify A, B, C
         and D. Write the equations.

         (OR)

      c) An organic compound 'A' of molecular formula C₃H₆O undergoes halform
         reaction. Compound 'A' reacts with chloroform in presence of KOH to give
         B of molecular formula C₄H₇OC₂l₃ and with conc. H₂SO₄ gives a hydrocarbon.
         Identify A, B & C. Write the equations.

      d) 0.5 F of electric current was passed through 5 molar solutions of AgNO₃,
         CuSO₄ and AlCl₃ connected in series. Find out the concentration of each
         of the electrolyte after the electrolysis.