STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2019-10 & thereafter)

SUBJECT CODE: 19CH/AC/FC43

B.Sc. DEGREE EXAMINATION, APRIL 2023
BRANCH III - PHYSICS
FOURTH SEMESTER

COURSE : ALLIED – CORE
PAPER : FUNDAMENTALS OF CHEMISTRY- II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

Answer all the questions: **(30 x 1 = 30)**
Choose the correct answer:

1. The structure of $[NiCl_4]^{2-}$ ion is
   a. linear b. tetrahedral c. triangular planar d. square planar

2. EDTA is a
   a. monodentate b. bidentate c. tridentate d. hexadentate ligand

3. In $[CoF_6]^{3-}$ the Co^{3+} ion is
   a. sp hybridized b. sp^2 hybridized c. sp^3d^2 hybridized d. sp^3d^3 hybridized

4. The degree of dissociation of week electrolyte increases as
   a. pressure increases b. dilution decreases c. dilution increases d. pressure decreases

5. The equivalent conductance of Ba^{2+} and Cl^- are respectively 127 and 76 $ohm^{-1}\ cm^{-1}\ eq^{-1}$ at infinite dilution. The equivalent conductance of $BaCl_2$ at infinite dilution will be
   a. 139.5 b. 203 c. 279 d. 101.5l $ohm^{-1}\ cm^{-1}\ eq^{-1}$

6. $[Co(NO_2)(NH_3)_5]Cl_2$ and $[Co(ONO)(NH_3)_5]Cl_2$ are
   a. ionization isomers b. linkage isomers
   c. hydrate isomers d. coordination isomers

7. Which of the following is a chelating ligand?
   a. $H_2N\text{-}CH_2\text{-}CH_2\text{-}NH_2$ b. H_2O c. CO d. NH_3

8. A metal present in Vitamin B_{12} molecule is
   a. zinc b. aluminium c. iron d. cobalt

9. Which of the following is not true about hemoglobin
   a. It carries oxygen from lungs to the muscle tissues
   b. It carries carbon dioxide from worked up muscle tissues to the lungs
   c. the heme group of hemoglobin consists of magnesium atom
   d. The oxygenated hemoglobin is called oxyhemoglobin.

10. Which of the following metals can displace hydrogen from acid?
    a. Zn b. Cu c. Ag d. Pt

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Fill in the blanks:

11. The equivalent weight of sulphuric acid is --------.
12. For a one component system the maximum number of degrees of freedom is ---------.
13. In DTA the difference in -------- between the sample and inert reference is measured.
14. In a galvanic cell ---------energy is converted into electrical energy.
15. The electrode potential is given a ---------sign if the electrode reaction is oxidation when coupled with a standard hydrogen electrode.
16. The oxidation state of nickel in $[Ni(CN)_4]^{2-}$ is ---------.
17. The molarity of a sodium hydroxide solution containing 10 gm of sodium hydroxide in 1000mL of solution is -------- .
18. The chemical formula of hexaaquachromium(III) chloride is ---------- .
19. The tendency of an electrode to gain electrons is called its ---------potential.
20. In Thermogravimetric Analysis the plateau in the thermogram indicates --------- weight.

State whether true or false:

21. Optical isomers have identical physical and chemical properties.
22. A coordination complex retains its identity in dissolved state.
23. $[NiCl_4]^{2-}$ is diamagnetic.
24. The equivalent conductivity at any concentration is inversely proportional to the degree of dissociation at that concentration.
25. For an exothermic reaction the DTA curve shows elevation.

Answer in a line or two:

26. Define molar conductance.
27. Write Nernst equation.
28. Define molality of a solution.
29. Define eutectic temperature.
30. Write Ostwald dilution law.

SECTION - B

Answer any five questions: **(5 x 6 = 30)**

31. Discuss the DTA of calcium oxalate.
32. Explain the phase diagram of water system.
33. With the help of a block diagram explain the instrumentation for DSC.
34. Explain the variation of conductance with dilution for a strong and weak electrolyte.
35. Explain the principle of conductometric titration also describe the study of NaOH and HCl using conductometry.
36. Discuss any two applications of Kohlrausch's law.
37. a) What is electrochemical series? Give any two application
    b) Write the IUPAC names of i) $K_4[Fe(CN)_6]$ ii)[$Cu(NH_3)]SO_4$ (4+2)

SECTION - C

Answer any two questions: **(2 x 20 = 40)**

38. a. Write notes on the following (5+5)

i. Lead storage battery ii. Calomel electrode

b. Explain with example how the equivalent weight of oxidants and reductants in a redox reaction is calculated. (5)

c. Explain the functions of vitamin B_{12} . (5)

39. a. Describe the principle and instrumentation of TGA. Explain the factors that affect TGA (10)

b. Draw the TGA plot of Calcium oxalate monohydrate and explain. (4)

c. Explain with examples the geometric isomerism of 4 coordinated complex. (6)

40. a. Explain the structures of $[Ni(CN)_4]^{2-}$ (diamagnetic) and $[CoF_6]^{3-}$(paramagnetic) and calculate the magnetic moment. (4+4)

b. Describe the phase diagram of bismuth-cadmium system. (6)

c. Explain the terms: i) Ionisation isomerism ii) hydrate isomerism iii) bidentate ligand. (2+2+2)