**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086**
**(For candidates admitted during the academic year 2023-24 & thereafter)**

**B.Sc. DEGREE EXAMINATION, APRIL 2026**
**BRANCH III - PHYSICS**
**FOURTH SEMESTER**

**COURSE : ALLIED – CORE**
**PAPER : FUNDAMENTALS OF CHEMISTRY- II**
**SUBJECT CODE : 23CH/AC/FC43**
**TIME : 3 HOURS MAX. MARKS : 100**

| Q. No | SECTION A Answer all Questions (15x 1=15) | CO | KL |
|---|---|---|---|
| 1 | In 1 M solution of sulphuric acid, the moles of hydrogen ions present will be<br>a) 1.0 M b) 2.0 M c) 3.0 M d) 4.0 M | CO1 | K1 |
| 2 | Equivalent weight of $Na_2CO_3$ is _____<br>a) 53 b) 56 c) 106 d) 54 | CO1 | K1 |
| 3 | The number of moles of a solute per kilogram of the solvent is called<br>a) Molality b) Normality c) Molarity d) Formality | CO1 | K1 |
| 4 | The unit of specific conductance is_____<br>a) Ohm m b) ohm $m^{-1}$ c) $ohm^{-1}$ m d) $ohm^{-1}$ $m^{-1}$ | CO1 | K1 |
| 5 | Example of a primary cell is_____<br>a) Dry cell b) Ni-Cd cell<br>c) Mercury cell d) Lead storage cell | CO1 | K1 |
| 6 | When a strong acid is titrated against a strong base, the end point is the point of _____<br>a) Zero conductance b) Maximum conductance<br>c) Minimum conductance d) None of these | CO1 | K1 |
| 7 | The number of degrees of freedom for a one-component system with two phases in equilibrium is _____<br>a) 0 b) 1 c) 2 d) 3 | CO1 | K1 |
| 8 | Which of the following is an example of two component system<br>a) Water b) Pb-Ag<br>c) Carbon dioxide d) Sulphur | CO1 | K1 |
| 9 | The phase rule is given by:<br>a) F = C + P – 2 b) F = C - P + 2<br>c) F = C + P + 2 d) F = C - P - 2 | CO1 | K1 |
| 10 | Example of an unidentate ligand is _____<br>a) EDTA b) en c) aqua d) oxalate | CO1 | K1 |
| 11 | Cyanocobalamin is _____(Vitamin)<br>a) Vitamin A b) Vitamin B12<br>c) Vitamin C d) Vitamin B7 | CO1 | K1 |
| 12 | The number of donor atoms in oxalato is _____<br>a) 4 b) 3 c) 2 d) 1 | CO1 | K1 |
| 13 | In TGA parameter that is measured is_____<br>a) Change in weight b) change in volume<br>c) Enthalpy change d) density | CO1 | K1 |

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| 14 | Reference material used in DSC is _____<br>a) $Al_2O_3$ b) BaO c) CaO d) $CeO_2$ | CO1 | K1 |
| 15 | For the study of polymer decompositions _____gas is used as an inert atmosphere.<br>a) Argon b) helium c) nitrogen d) hydrogen | CO1 | K1 |
| | **SECTION B Answer all Questions (15x 1=15)** | **CO** | **KL** |
| 16 | Unit of molality is _____. | CO2 | K2 |
| 17 | Ostwald's dilution law is applicable for _____electrolytes. | CO2 | K2 |
| 18 | Number of triple points in $CO_2$ system is _____ | CO2 | K2 |
| 19 | The IUPAC name of $[Cr(en)_3]^{3+}$ is _____ | CO2 | K2 |
| 20 | Expansion of DSC is _____ | CO2 | K2 |
| 21 | $\Delta G^\circ$ and $E^\circ_{cell}$ are related as _____. | CO2 | K2 |
| 22 | In an electrochemical cell oxidation occurs at the _____. | CO2 | K2 |
| 23 | What is the function of a salt bridge? | CO2 | K2 |
| 24 | What is the number of phases present at the eutectic point of Bi-Cd system? | CO2 | K2 |
| 25 | Draw the structure of bipy. | CO2 | K2 |
| 26 | List any two factors that influence thermogram. | CO2 | K2 |
| 27 | How is equivalent weight of an acid determined? | CO2 | K2 |
| 28 | Give any one application of mole concept. | CO2 | K2 |
| 29 | Calculate the number of molecules in 10 g of $H_2O$. | CO2 | K2 |
| 30 | Calculate the transport number of $Cl^-$ ion in KCl. (Given: the transport number of $K^+$ ion in is 0.492) | CO2 | K2 |
| | **SECTION C Answer any Six (6 x 5 = 30)** | **CO** | **KL** |
| 31 | Define the following terms:<br>a) Normality b) Molarity c) Mole fraction | CO3 | K3 |
| 32 | a) Derive the relation between molar conductance and specific conductance. (2)<br>b) How does molar conductance vary with concentration for strong and weak electrolytes? (3) | CO3 | K3 |
| 33 | Explain the following with suitable examples:<br>a) Hydrate isomerism b) Linkage isomerism. | CO3 | K3 |
| 34 | Draw the thermogram of calcium oxalate and explain. | CO3 | K3 |
| 35 | Explain the phase diagram of Pb-Ag system. | CO3 | K3 |
| 36 | Illustrate the use of SHE as reference electrode. | CO3 | K3 |
| 37 | Deduce the structure of $[NiCl_4]^{2-}$ (n=2) as according to VBT. | CO3 | K3 |

| | SECTION D Answer any Four (4x 5=20) | CO | KL |
|---|---|---|---|
| 38 | a) Explain mole concept with an example. (2)<br>b) Calculate the weight of calcium atoms that contain same number of atoms as present in 2.4g of magnesium. (Atomic weight of Mg = 24, Ca = 40) (3) | CO4 | K4 |
| 39 | Describe Hydrogen-Oxygen fuel cell. | CO4 | K4 |
| 40 | Discuss geometrical isomerism in complexes with coordination number 4. | CO4 | K4 |
| 41 | Elaborate on the structural features and functions of Vitamin $B_{12}$ | CO4 | K4 |
| 42 | Explain Kohlrausch's law and discuss any one application. | CO4 | K4 |

| | SECTION E Answer the following (2x10=20) | CO | KL |
|---|---|---|---|
| 43 | a) Give the principle of conductometric titrations and explain its various types<br>**OR**<br>b) Discuss the principle and instrumentation of TGA. | CO5 | K5 |
| 44 | a) i) Calculate the equivalent weight of $KMnO_4$ in neutral medium.<br>ii) Sketch the phase diagram of water and explain the application of phase rule to its triple point. (3+7)<br>**OR**<br>b) i) Construct the electrochemical series and discuss its applications.<br>ii) In accordance with VBT, explain the geometry of $[FeF_6]^{3-}$ (n=5) and $[NiCl_4]^{2-}$ (n=2). (6+4) | CO5 | K5 |

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