STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2023-24)

B.Sc. DEGREE EXAMINATION, NOVEMBER 2023
BRANCH IV- CHEMISTRY
FIRST SEMESTER

COURSE : MAJOR CORE
PAPER : GENERAL CHEMISTRY
SUBJECT CODE : 23CH/MC/GC14
TIME : 3 HOURS MAX.MARKS :100

Q. No.	**SECTION A (15 x1=15 marks)** **Answer all questions**	CO	KL
1	The total values of magnetic quantum number for a given value of azimuthal quantum number is a) 2l b) 2l + 1 c) 2l –1 d) 2l– 2	1	K1
2	Which of the following is found in the UV region of the spectrum? a) Pfund series b) Brackett series c) Lyman series d) Paschen series	1	K1
3	The alpha particles generated in the Rutherford scattering experiment are a) hydrogen nucleus b) argon nucleus c) helium nucleus d) krypton nucleus	1	K1
4	The correct order of first ionization potential among the following elements is a) B < Be < C < O < N b) B < Be < C < N < O c) Be < B < C < N < O d) Be < B < C < O < N	1	K1
5	What is the correct order of electronegativity among the following options? a) Li < Na < K < Rb < Cs b) Li < K < Na < Rb < Cs c) Li > Na > K > Cs > Rb d) Li > Na > K = Rb > Cs	1	K1
6	Which of the following cations has the smallest radius? a) Na^+ b) Li^+ c) Be^{2+} d) K^+	1	K1
7	Which among the following is a base? a) Ethane b) aniline c) BH_3 d) BF_3	1	K1
8	Which among the following is a non-polar solvent? a) $CHCl_3$ b) CCl_4 c) NH_3 d) H_2O	1	K1
9	Pick the acid from the list a) BaO b) CaO c) ZnO d) SiO_2	1	K1
10	The "magic numbers" for atoms are (a) numbers of electrons that confer atomic stability. (b) numbers of protons and/or neutrons that confer nuclear stability. (c) n/p ratios that confer nuclear stability. (d) atomic masses that confer nuclear stability.	1	K1

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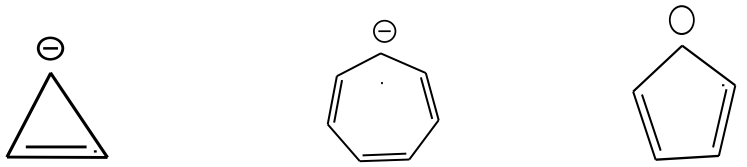
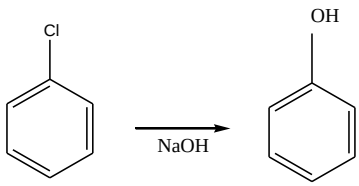
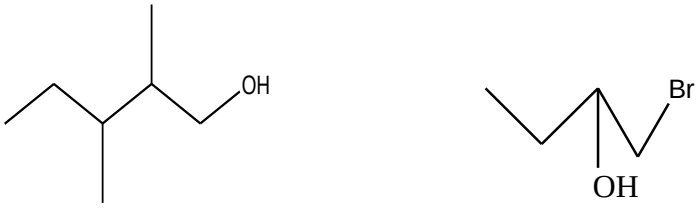
11	Which of the following is true regarding the Bohr model of atoms? a) Assumes that the angular momentum of electrons is quantized b) Uses Faraday's laws c) Predicts continuous emission spectra for atoms d) Predicts the same emission spectra for all types of atoms	1	K1
12	Electron pair acceptor is an acid according to _____ theory. a) Lowry b) Lux – Flood c) Lewis d) Solvent	1	K1
13	Which of the following pairs represents isobars? (a) $^{17}O_8$ and $^{16}O_8$ (b) $^{40}K_{19}$ and $^{40}Ca_{20}$ (c) $^{15}N_7$ and $^{16}O_8$ (d) $^{235}U_{92}$ and $^{238}U_{92}$	1	K1
14	The electrophile in the following is_____ a) Cl^- b) ^-OH c) NH_3 d) NO_2^+	1	K1
15	Which of the following statements is true for benzene? (a) Benzene easily undergoes addition due to unsaturation (b) $\boldsymbol{\pi}$-electrons are delocalised in the benzene ring (c) Three isomeric forms are formed on monosubstitution of benzene (d) Two types of C-C bonds are present in benzene	1	K1

Q. No.	**SECTION B (15 x 1=15 marks)** **Answer all questions**	CO	KL
16	The unit used to measure the amount of radiation absorbed by a gram of material is called_____	2	K2
17	Define mass defect.	2	K2
18	What is K-electron capture?	2	K2
19	Mention the limitation of Bronsted -Lowry theory.	2	K2
20	An isotone of $^{14}C_6$ is _____	2	K2
21	The Heisenberg Principle states that _____.	2	K2
22	What is de Broglie equation?	2	K2
23	What is photoelectric effect?	2	K2
24	Define inductive effect.	2	K2
25	Alred – Rochow's electronegatvity depends upon _____	2	K2
26	If a nitrogen-14 nuclide captures an alpha particle, a proton is produced along with _____	2	K2
27	Tl(I) is more stable than Tl(III). Give reason.	2	K2
28	The solvents which have little or no levelling effect on strength of acids or bases are _____	2	K2
29	Write the structure of acetaldehyde and give its IUPAC nomenclature.	2	K2
30	Define the term resonance energy.	2	K2

Q. No.	**SECTION C (6 x 5 = 30 marks)** **Answer any six questions**	CO	KL
31	Explain the postulates of quantum mechanics.	3	K3
32	Compare the radioactive disintegration series 4n, 4n+1, 4n+2 and 4n+3.	3	K3
33	Differentiate between carbocation, carbanion and free radicals.	3	K3
34	Categorize periodic properties for Li,Na,K,Rb,Cs..	3	K3
35	Explain the anomalous behaviour of Lithium and elaborate on the diagonal with magnesium.	3	K3
36	a) Explain artificial transmutation of elements. b) State and explain soddy's group displacement law. (3+3)	3	K3
37	Classify the following as aromatic nonaromatic and antiromatice baed on Huckel's rule. Give reas for the same. i) ii) iii) 	3	K3

Q. No.	**SECTION D (4 x 5=20marks) Answer any four questions**	CO	KL
38	Discuss the Postulates of Bohr's theory.	4	K4
39	The half-life of ^{18}F is 109.7 minutes. If radiolabeled Prozac were administered to a patient for a PET scan at 8:00 A.M. on Monday, at what time would its activity reach 10% of the original activity?	4	K4
40	Applying the principle of HSAB theory explain the stability of $(AlF_6)^{3-}$, $(AlCl_6)^{3-}$, $(AlI_6)^{3-}$	4	K4
41	Discus the characteristics of α, β and γ emission	4	K4
42	Arrange the following in increasing order of acidity and give reasons for the same. a) CH_3COOH, CF_3COOH, CHF_2COOH, CH_2FCOOH b) HF, HCl, HBr, HI. (3+2)	4	K4

Q. No.	**SECTION E (2 x 10=20 marks) Answer any two questions**	CO	KL
43	a) Explain the significance of quantum numbers b) Write the Schrodinger wave equation and explain the terms involved. c) Explain the following terms (i) Hamiltonian operator (ii) Eigen function and Eigen value of operators (5+3+2)	5	K5
44	a) Apply Slater's rule to determine the effective nuclear charge of the 3s electron of Na.. b) Discuss the periodic properties of with respect to atomic size, ionization energy, electron affinity and electronegativity for Li,Be,B,C,N,F and Ne.	5	K5

45	a) Explain Liquid drop model. b) Explain the working of Geiger – Muller counter and Scintillation counter. c) Explain with mechanism the following reactions (i)  (ii) $CH_3 – CH = CH_2 \xrightarrow{H_2} CH_3 – CH_2 – CH_3$ (iii) $CH_3 – CH_2 – CH = CH_2 \longrightarrow CH_3 – CH = CH – CH_3$ (iv) $R – \underset{H}{\underset{\vert}{C}} = O + HCN \longrightarrow R – \underset{H}{\underset{\vert}{\underset{CN}{\underset{\vert}{C}}}} – OH$	5	K5
46	a) Write the IUPAC nomenclature for the following (i) (ii)  (iii) (iv)  b) Give the bond line structure for the following (i) 2,4 - dimethylpentane (ii) Hexan – 3 – ene c) Explain how N/P ratio, magic numbers and packing fraction affect the stability of the nucleus. (4+2+4)	5	K5

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