22CHP314N

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(Third Semester)

Branch - **CHEMISTRY**

SOLID STATE AND NUCLEAR CHEMISTRY

Time: Three Hours Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	The X-ray diffraction is based upon -------. a) Illkovic equation b) Bragg's equation c) Boltzmann equation d) Van deemter equation.	K1	CO1
	2	Which one of the following techniques can be considered as finger spectra ? a) NMR b) Mass c) X-ray diffraction d) Fluorimetry	K2	CO1
2	3	Schottky defect in crystals is observed when: a) an ion leaves its normal site and occupies an interstitial site b) an unequal number of cations and anions are missing from the lattice c) density of the crystal is increased d) an equal number of cations and anions are missing from the lattice.	K1	CO2
	4	With which one of the following elements silicon should be doped so as to give p-type of semiconductor? a) Germanium b) Arsenic c) Selenium d) Boron	K2	CO2
3	5	The average binding energy of a nucleus is-----. a) 8 KeV b) 80 eV c) 8 eV d) 8 MeV	K1	CO3
	6	Packing fraction may have-----. a) Negative value b) Positive value c) Both A & B d) None of these	K2	CO3
4	7	The angular frequency of a cyclotron is independent of----. a) Speed b) Mass c) Magnetic field d) Charge	K1	CO4
	8	Which of the following describes what occurs in the fission process? a) A heavy nucleus is fragmented into lighter ones b) A neutron is split into a neutron and proton c) Two light nuclei are combined into a heavier one d) A proton is split into three quarks	K2	CO4
5	9	Name the moderator used in the nuclear reactor? a) Plutonium b) Thorium c) Graphite d) Berilium	K1	CO5
	10	What is the beneficial aspect of nuclear fission? a) The ability to absorb energy b) The ability to produce more energy than nuclear fusion c) The ability to release tremendous amounts of energy d) There are no beneficial aspects of nuclear fission	K2	CO5

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SECTION - B (35 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Describe the principle and applications of neutron diffraction.	K2	CO1
		(OR)		
	11.b.	Discuss the structure of zinc blende.		
2	12.a.	Discuss the electrical and mechanical properties of metals.	K3	CO2
		(OR)		
	12.b.	Explain band theory of solids.		
3	13.a.	Define Binding energy and explain its importance.	K4	CO3
		(OR)		
	13.b.	Write short notes on nuclear cross section of nucleus.		
4	14.a.	Explain cloud chamber for the determination and detection of particles.	K4	CO4
		(OR)		
	14.b.	Explain the principle and working of cyclotron.		
5	15.a.	Discuss the characteristics of nuclear fission reactions.	K4	CO5
		(OR)		
	15.b.	Explain isotope dilution analysis method.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions
ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Distinguish between x ray, electron and neutron diffractions.	K4	CO1
2	17	Illustrate the types of semiconductors. Write the effect of temperature on semi conductors.	K5	CO2
3	18	Describe the liquid drop model.	K6	CO3
4	19	Explain the principle, working and applications of scintillation counter.	K4	CO4
5	20	Explain the following with suitable examples i) transmutation by alpha particle ii) transmutation by protons.	K5	CO5

Z-Z-Z END