

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	Graphite is a good conductor because a) it is crystalline b) it has free electrons c) it has free atoms d) it has sp ³ hybridization	K1	CO1
	2	Neutron diffraction involves a) nuclear scattering b) magnetic scattering c) Rayleigh scattering d) both nuclear and magnetic scattering	K2	CO1
2	3	According to band theory of metals there are closely spaced energy levels called bands. The top of the filled energy levels is known as a) Pauling level b) Boltzmann level c) Fermi level d) Boson level	K1	CO2
	4	Due to formation of Schottky defects, the density of the crystal a) increases slightly b) increases appreciably c) decreases slightly d) decreases appreciably	K2	CO2
3	5	The effect of Coulomb barrier depends on a) atomic number of product nucleus b) Energy of electron or positron c) Both atomic number of product nucleus and energy of electron or positron d) None of these	K1	CO3
	6	The binding energy oxygen molecule is 128 MeV. What is the binding energy per nucleon? a) 12.8 b) 1.28 c) 16 d) 8	K2	CO3
4	7	Cyclotron is not suitable for accelerating a) nitrogen nuclei b) α-particles c) neutrons d) protons	K1	CO4
	8	The end product of the natural radioactive series is a) bismuth b) polonium c) any isotope of lead d) thorium	K2	CO4
5	9	The easily fissionable isotope of uranium is a) ⁹² U ²³³ b) ⁹² U ²³⁵ c) both a and b d) None of these	K1	CO5
	10	Which of the following is a fertile nuclide? a) Pb-206 b) U-238 c) U-235 d) Th-236	K2	CO5

Cont...

Module No.	Question No.	Question	K Level	CO
1	11.a.	Apply your knowledge to distinguish between X-ray, neutron, and electron diffraction techniques.	K3	CO1
	(OR)			
	11.b.	Outline how Fourier synthesis is utilized in the analysis of s-tetrazine's crystal structure.		
2	12.a.	Illustrate the various types of defects with suitable examples.	K2	CO2
	(OR)			
	12.b.	Explain about the Band theory of solids.		
3	13.a.	Show the differences between the following, i) Stable subatomic particles and unstable atomic particles ii) Nuclear mass and nuclear radii	K3	CO3
	(OR)			
	13.b.	Examine and explicate the meson field theory of nuclear forces.		
4	14.a.	Compare the G.M. counter with the proportional counter.	K4	CO4
	(OR)			
	14.b.	Examine the principle of scintillation counter and determine how it impacts photon collection methods.		
5	15.a.	Describe the various types of nuclear transformations.	K4	CO5
	(OR)			
	15.b.	Outline the types and classification of nuclear reactors.		

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	Examine the structure of zinc blende and wurtzite.	K4	CO1
2	17	Analyze the types and structure of semiconductor and discuss the effect of temperature on semiconductors.	K4	CO2
3	18	Importance of the following, a) Mass defect b) binding energy c) Stability of nucleus	K4	CO3
4	19	Critically evaluate the advantages of different particle accelerators in nuclear chemistry.	K4	CO4
5	20	List and discuss the applications of radioactive isotopes in various fields.	K4	CO5

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END