UNIT-1: THE SOLID STATE

One mark questions:		
1. What is anisotropy?	К	
2. Between glass and copper, which one is isotropic in nature?	U	
3. Arrange these solids in their increasing order of inter molecular attractions:	А	
ice, I ₂ , solid ammonia		
4. Ionic solids conduct electricity in molten state but not in solid state. Give reason	U	
5. Is diamond a network or a metallic solid?	К	
6. What type of crystalline solid is AIN?	К	
7. Which type of crystalline solids have very high melting point?	К	
8. Define coordination number	К	
9. How many 3 dimensional crystal lattices are possible?	к	
10. What is the coordination number of a particle in hcp?	U	
11. How many octahedral voids are in ccp unit cell?	U	
12. What is an end centred unit cell?	к	
13. What is the formula of the compound if the unit cell of it contains atoms A, B and C	А	
and occupy the lattice points as shown?		
14. Nickel crystallizes as FCC. How many unit cells are required to accommodate one		
mole of nickel atoms?	U	
15. Define packing efficiency.	К	
16. Write the relationship between density and edge length of a unit cell.	К	
17. What type of defect is exhibited by the solid solution of $CdCl_2$ and $AgCl$?	U	
18. What are F-centres?	К	
19. What is the colour imparted to/by KCl due to anionic vacancies?	К	
20. ZnO turns yellow on heating. Name the type of defect created?	К	
21. What are non stoichiometric defects?	К	
22. A sample of nickel oxide has the formula $Ni_{0.98}O$. Name the type of non		
stoichiometric defect it exhibits.	U	
23. What are intrinsic semiconductors?	К	
24. How does electrical conductivity of an electrolyte vary with temperature?	U	

25	. Name the type of semiconductor obtained when Ge is doped with indium.	U				
26	26. How are the domains arranged in MnO if it is a anti-ferromagnetic material?					
27	27. Give an example for the substance that exhibits ferrimagnetism.					
28	A metal has bcc system. What is the relationship between length of the body					
	diagonal and radius of the metal atom?	U				
Tw	o mark questions					
1.	1. Distinguish crystalline and amorphous solids with respect to:					
	i) melting point ii) heat of fusion					
2. What type of attractive force exists between constituent particles in: i) solid						
	ii) SiO ₂					
3.	Write the differences between metallic and ionic crystalline solids	К				
4.	4. Write the differences between metallic and molecular crystalline solids					
5.	Name two types of 2 dimensional close packing arrangement.	U				
6.	Name the two parameters that characterise a unit cell.	К				
7.	. Define unit cell and crystal lattice.					
8.	8. How many possible variations are in a cubic crystal system? Which one of these					
has 4 particles / unit cell?						
9.	What portion of the atom (or particle) belongs to a unit cell if it is located	U				
	i) in the body of the unit cell					
	ii) at the centre of an edge of the unit cell?					
10	. How many lattice points in unit cell of i) FCC ii) end centred	U				
11	11. Write one similarity and one difference between hcp and ccp					
12	12. Calculate the number of atoms in face centred cubic unit cell.					
13. Calculate the number of atoms in body centred cubic unit cell.						
14	. In a compound, atoms A form ccp, atoms of B occupy all the tetrahedral voids and					
	atom C occupy all the octahedral voids. What is the formula of the compound?	А				
15	. A metal oxide crystallises in hcp arrangement for its oxide ions. 2/3rds of					
	octahedral voids are occupied by metal ions. What is the formula of the metal					
	oxide?	S				
16	. Aluminium crystallizes in ccp structure. Its metallic radius is 125 pm. Calculate the					
	length of the face diagonal of the unit cell.					
17. A metal crystallizes in bcc structure. Edge length of the unit cell is 300 pm. How						
	many unit cells are in 5 cm ³ of the metal?	S				
18	. What are point defects and line defects?	К				

19. Distinguish between Frenkel and Schottky defects.					
20. Explain metal excess defect due to anionic vacancy.					
21. Explain metal deficiency defect using ZnO as an example.	U				
22. Electrical conductivity of a semiconductor (i) increases with temperature (ii)					
increases on doping with a suitable material. Give reasons.	К				
23. Write the differences between n-type and p-type semiconductors.	U				
24. What type of semiconductor is obtained when:					
i) silicon is doped with phosphorus ii) silicon is doped with boron?	А				
25. Mention the factors responsible for the magnetic moment of an electron.	К				
26. Write the differences between ferrimagnetic and ferromagnetic substances	U				
Three mark questions:					
1. Based on intermolecular forces, name the three types of molecular solids. Mention					
the forces of attraction in them.	к				
2. Differentiate covalent and polar molecular solids based on					
i) constituent particles ii) bonding iii) melting point	U				
3. Match the type of packing in column-I to column-II:					
Column-I Column-II					
i) Square close packing in 3 a) The first layer and the fourth layer are					
dimensions identical					
ii) Hexagonal close packing in 3 b) All layers are identical					
dimensions c) The first layer and the third layer are	U				
iii) Cubic close packing in 3 identical					
dimensions					
4. What type of unit cells are A and B? How many particles per unit cell in B?					
	U				
A B	к				
5. Calculate the packing efficiency in cubic close packing (ccp) structure .	к				
6. Calculate the packing efficiency in bcc structure.					
7. Calculate the packing efficiency in simple cubic lattice.					
8. An element crystalises in fcc and has edge length 0.56 nm. Calculate the density o					
the element. Molar mass of the element is 40 $gmol^{-1}$.					
9. An element X has a density of 6.23 g cm^{-3} . If the edge length of the unit cell is					

	4 ×	10 ⁻⁸ cm, identify the type of cubic unit cell.	S		
	Giv	ren : molar mass of the element = 60 gmol $^{-1}$.			
10	. A r	netal crystallizes in bcc unit cell. The atomic mass of the metal is 55.8 g mol $^{-1}$,	S		
	dei	nsity = 7.9 g cm ^{-3} . Calculate the edge length of the unit cell?			
11	11. What type				
	i)	of defect is introduced when molten NaCl is crystallised with SrCl ₂ ?			
	ii)	of vacancy is produced? How many moles of these vacancies are created if the			
		crystal obtained has 10^{-3} mole of Sr ⁺² ions?			
12	. Aco	count for the following:	U		
	i)	Silicon doped with Al is p type semiconductor			
	ii)	Frenkel defect does not change the density of ionic crystals			
	iii)	non-polar molecular solids have very low melting and boiling points.			
13	. Dif	ferentiate metals, insulators and semiconductors in terms of band theory.	U		
14	. Arr	angement of magnetic domains are as given:	К		
	i) 1	$\uparrow \downarrow \uparrow \downarrow \uparrow \downarrow \qquad \text{ii)} \uparrow \uparrow \downarrow \downarrow \downarrow \uparrow \uparrow \uparrow$			
	Wł	nat type of magnetic property is in (i) and (ii)? Which one of this becomes			
	ра	ramagnetic on heating?	U		
Fiv	e m	ark questions:			
1.	a)	A cubic solid has elements P and Q. Atoms of Q at the corners and atom P at			
		the body centre. i) what is the formula of the solid? ii) What is the			
		coordination number of P & Q?			
	b)	A compound forms hcp structure. What is the total number of voids in 0.4 mol			
		of it? How many of these are tetrahedral voids? Given $N_A = 6.022 \times 10^{23}$.	А		
2.	Wi	th respect to Frenkel and Schottky defects:			
	i)	In which type of crystalline solids are these found?			
	ii)	When is Frenkel defect possible?			
	iii)	What type of defect does these show? i) ZnS ii) NaCl iii) AgBr	U		
3.	a)	In FeO solid, some Fe^{2+} ions are missing, but the charge is balanced by the			
		presence of Fe ³⁺ ions. i) If Fe ²⁺ ions missing are 15, how many Fe ³⁺ ions balance			
		the charge? ii) What type of defect does this lead to? iii) If for 100 O^{-2} ions the			
		number of Fe ²⁺ and Fe ³⁺ are 85 and 10 respectively, what is the composition of			
		the non-stoichiometric FeO solid formed?			
	b)	i) How many types of primitive unit cells are known? ii) Name any one			
		crystal system for which only primitive unit cells are possible.	S		