

**Topic : Solid State**

**Type of Questions**

**M.M., Min.**

Single choice Objective ('-1' negative marking) Q.1 to Q.10

(3 marks, 3 min.)

[30, 30]

Match the Following (no negative marking) Q.11

(8 marks, 10 min.)

[8, 10]

1. Column A describe nature of bonding and Column B the solid having that type of bonding :

A (Nature of bonding)	B (solid)
I. Van der Waals	<b>P.</b> Al, Cd
II. Ionic	<b>Q.</b> CO <sub>2</sub> , H <sub>2</sub>
III. Metallic	<b>R.</b> Si, diamond
IV. Covalent	<b>S.</b> MgO, NaCl

Correct matching of A and B is in alternate :

	I	II	III	IV		I	II	III	IV
(A)	P	Q	R	S	(B)	Q	S	P	R
(C)	Q	P	R	S	(D)	S	P	Q	R

2. (a) The most unsymmetrical crystal system is:

(A) Cubic (B) Hexagonal (C) Triclinic (D) Orthorhombic

(b) The number of crystal systems known are :

(A) 7 (B) 8 (C) 6 (D) 4

3. (a) Tetragonal crystal system has the following unit cell dimensions:

(A)  $a = b = c$  and  $\alpha = \beta = \gamma = 90^\circ$  (B)  $a = b \neq c$  and  $\alpha = \beta = \gamma = 90^\circ$   
(C)  $a \neq b \neq c$  and  $\alpha = \beta = \gamma = 90^\circ$  (D)  $a = b \neq c$  and  $\alpha = \beta = 90^\circ, \gamma = 120^\circ$

(b) The lattice parameters of a given crystal are  $a = 5.62 \text{ \AA}$ ,  $b = 7.41 \text{ \AA}$  and  $c = 9.48 \text{ \AA}$ . The three coordinate axes are mutually perpendicular to each other. The crystal is :

(A) tetragonal (B) orthorhombic (C) monoclinic (D) trigonal.

4. (a) Which of the following is not a crystal system ?

(A) Triclinic (B) Rhombohedral (C) Tetragonal (D) Isomorphous.

(b) The most unsymmetrical and the most symmetrical crystal systems based on lattice parameters (i.e., unit cell lengths and angles), are respectively represented by the examples

(A) CuSO<sub>4</sub> · 5H<sub>2</sub>O, NaCl (B) Monoclinic sulphur, diamond  
(C) rhombic sulphur, NaCl (D) diamond, NaCl



5. (a) The crystal system in which  $a \neq b \neq c$  and the angles  $\alpha \neq \beta \neq \gamma$  is  
 (A) Triclinic (B) monoclinic (C) hexagonal (D) cubic
- (b) The unit cell parameters of a rhombohedral crystal are  
 (A)  $a \neq b \neq c, \alpha = \beta = \gamma = 90^\circ$  (B)  $a = b = c, \alpha = \beta = \gamma \neq 90^\circ$   
 (C)  $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90^\circ$  (D)  $a = b \neq c, \alpha = \beta = \gamma = 90^\circ$
6. (a) Three elements P, Q and R crystallize in a cubic solid lattice. The P atoms occupy the corners, Q atoms the cube centres and R atoms the edges. The formula of the compound is:  
 (A) PQR (B)  $PQR_2$  (C)  $PQR_3$  (D)  $PQ_3R$ .
- (b) A compound alloy of gold and copper crystallises in a cubic lattice in which the gold atoms occupy the lattice points at the corner of a cube and the copper atoms occupy the centres of each of the cube faces. Hence compound alloy has formula :  
 (A) AuCu (B)  $Au_3Cu$  (C)  $Au_2Cu$  (D)  $AuCu_3$
7. In a face centred cubic arrangement of A and B atoms whose A atoms are at the corner of the unit cell and B atoms at the face centres. One of the A atom is missing from one corner in unit cell. The simplest formula of the compound is  
 (A)  $A_7B_3$  (B)  $AB_3$  (C)  $A_7B_{24}$  (D)  $A_2B_3$
8. The compound AB crystallizes in cubic lattice in which both the elements have co-ordination number of eight. The crystal class is :  
 (A) simple cubic (B) face-centered cubic  
 (C) body-centered cubic (D) None of these.
9. (a)  $TiO_2$  is well known example of  
 (A) Triclinic system (B) Tetragonal system  
 (C) Monoclinic system (D) None
- (b) In the primitive cubic unit cell, the atoms are present at the :  
 (A) corners of the unit cell (B) centre of the unit cell  
 (C) centre of each face of the unit cell (D) one set of faces of the unit cell
10. (a) Which has no axis of rotation of symmetry ?  
 (A) Hexagonal (B) Orthorhombic (C) Cubic (D) Triclinic
- (b) A compound is formed by elements A and B. This crystallises in the cubic structure where the A atoms are at the corners of the cube and B atoms are at the body centres. The simplest formula of the compound is :  
 (A)  $A_8B_4$  (B)  $AB_6$  (C) AB (D)  $A_6B$
11. **Column-I** and **Column-II** contains four entries each. Entries of **Column-I** are to be matched with some entries of **Column-II**. One or more than one entries of **Column-I** may have the matching with the same entries of **Column-II**.

Column-I (Bravais Lattice(s))	Column-II [Crystal system]
(A) Primitive, face centered, body centered, end centered	(p) Cubic
(B) Primitive, face centered, body centered	(q) Orthorhombic
(C) Primitive, body centered	(r) Hexagonal
(D) Primitive only	(s) Tetragonal



# Answer Key

## DPP No. # 41

1. (B)      2. (a) (C) (b) (A)      3. (a) (B) (b) (B)      4. (a) (D) (b) (A)  
 5. (a) (A) (b) (B)      6. (a) (C) (b) (D)      7. (C)      8. (C)  
 9. (a) (B) (b) (A)      10. (a) (D) (b) (C)      11. (A) - (q) ; (B) - (p) ; (C) - (s) ; (D) - (r)

# Hints & Solutions

## PHYSICAL / INORGANIC CHEMISTRY

## DPP No. # 41

2. (a) For triclinic  $a \neq b \neq c$  &  $\alpha \neq \beta \neq \gamma \neq 90^\circ$   
 3. (b)  $a \neq b \neq c$  &  $\alpha = \beta = \gamma = 90^\circ$  the crystal system is orthorhombic  
 6. (a)  $P = 8 \times \frac{1}{8} = 1$  ;  $Q = 1 = 1$  ;  $R = 12 \times \frac{1}{4} = 3$  ; formula =  $PQR_3$   
 (b)  $Au = 8 \times \frac{1}{8} = 1$  ;  $Cu = 6 \times \frac{1}{2} = 3$  formula  $AuCu_3$   
 7.  $A = 7 \times \frac{1}{8} = \frac{7}{8}$  ;  $B = 6 \times \frac{1}{2} = 3$   
 Formula =  $A_{7/8} B_3$  or  $A_7 B_{24}$   
 10. (a) In triclinic unit cell.  
 $a \neq b \neq c$   
 $\alpha \neq \beta \neq \gamma$   
 (b). In simple cubic contribution of one corner =  $\frac{1}{8}$   
 total corner = 8  
 effective no. of atom per unit cell =  $\frac{1}{8} \times 8 = 1$   
 No. of bondy center in simple cubic = 1  
 No. of atom in body center = 1  
 AB

