

## Course outline

How does an NPTEL online course work?

## Week 1

- What is solid?
- Bravais lattice
- Indexing of crystal planes
- Simple crystal structures
- Diffraction of waves by crystals
- Fourier analysis of diffraction
- Diffraction condition
- Laue equations and Ewald construction
- Introduction to Brillouin zone
- Week 1 Feedback Form: Solid State Physics
- Quiz: Week 1: Assignment 1

## Week 2

## Week 3

## Week 4

## Week 5

## Week 6

## Week 7

## Week 8

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## Lecture notes

## Solutions

# Week 1: Assignment 1

The due date for submitting this assignment has passed.

**Due on 2021-09-08, 23:59 IST.**

As per our records you have not submitted this assignment.

**BCC and FCC lattice**

1) The number of lattice points inside bcc and fcc lattice are :

**2 points**

- 1 and 2  
 1 and 4  
 2 and 2  
 2 and 4

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
2 and 4

2) The number of neighboring sites to a lattice site in case of bcc and fcc lattice is:

**2 points**

- 4 and 8  
 8 and 12  
 4 and 6  
 6 and 12

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
8 and 12

**Packing fraction**

Assuming each lattice site occupied by one atom represented by the largest possible sphere, the packing fraction for:

3) Hexagonal close packed system is

**2 points**

- $\frac{\sqrt{2}\pi}{3}$   
  $\frac{\pi}{3\sqrt{2}}$   
  $\frac{2\pi}{3}$   
  $\frac{\pi}{6}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\frac{\pi}{3\sqrt{2}}$

4) Body centered cubic system is

**2 points**

- $\frac{\sqrt{3}\pi}{8}$   
  $\frac{2\sqrt{2}\pi}{3}$   
  $\frac{\pi}{8\sqrt{3}}$   
  $\frac{\pi}{6\sqrt{2}}$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\frac{\sqrt{3}\pi}{8}$

**Interplanar separation and Bragg's law**

Consider a plane hkl in crystal lattice.

5) The distance 'd(hkl)' between two adjacent parallel planes of the lattice (in real space) is

**2 points**

- $\frac{|\vec{G}|}{2\pi}$   
  $\frac{|\vec{G}|\pi}{2}$   
  $\frac{2\pi}{|\vec{G}|}$   
  $2\pi|\vec{G}|$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $\frac{2\pi}{|\vec{G}|}$

 6) Bragg's law  $2d\sin\theta = n\lambda$  can also be proved as:

**2 points**

- $2\vec{k} \times \vec{G} = G$   
  $2\vec{k} \cdot \vec{G} = G^2$   
  $2\vec{k} \times \vec{G} = G^2$   
  $2\vec{k} \cdot \vec{G} = G$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $2\vec{k} \cdot \vec{G} = G^2$

 7) **Structure factor**
**3 points**

Refer to the structure of CsCl discussed in the class, the structure factor for CsCl can be given as:

- $S_{\vec{G}} = f_A + f_B \exp -i\pi(v_1 + v_2 + v_3)$   
  $S_{\vec{G}} = f_A \exp -i\pi(v_1 + v_2 + v_3)$   
  $S_{\vec{G}} = f_A \cdot f_B \exp -i\pi(v_1 + v_2 + v_3)$   
  $S_{\vec{G}} = f_B \exp -i\pi(v_1 + v_2 + v_3)$

No, the answer is incorrect.  
Score: 0

Accepted Answers:  
 $S_{\vec{G}} = f_A + f_B \exp -i\pi(v_1 + v_2 + v_3)$