Unit 10 - Week 9

Assignment 9

The due date for submitting this assignment has passed. Due on 2019-10-02, 23:59 IST.
As per our records you have not submitted this assignment.

Note: More than one answer may be right. Partial marks awarded if only some of the correct answers are selected. No marks awarded if even one of the wrong answers is selected:

1) What is the main difference between real lattice and reciprocal lattice? *1 point*

- Both have units of length.
- Reciprocal lattice has unit which is inverse of wavelength.
- For some crystal structures, representation in reciprocal lattice is different from that in real lattice.
- Reciprocal space is a representation of real space in different frame work.

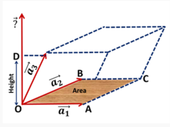
No, the answer is incorrect.
Score: 0
Accepted Answers:
Reciprocal lattice has unit which is inverse of wavelength.
For some crystal structures, representation in reciprocal lattice is different from that in real lattice.
Reciprocal space is a representation of real space in different frame work.

2) Triclinic structure's edge length and interaxial angles are _____ respectively. *1 point*

- $a_1 \neq a_2 = a_3; \alpha \neq \beta \neq \gamma \neq 90^\circ$
- $a_1 \neq a_2 \neq a_3; \alpha \neq \beta \neq \gamma \neq 90^\circ$
- $a_1 \neq a_2 \neq a_3; \alpha \neq \beta = \gamma \neq 90^\circ$
- $a_1 \neq a_2 \neq a_3; \alpha \neq \beta = 90^\circ, \gamma \neq 90^\circ$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$a_1 \neq a_2 \neq a_3; \alpha \neq \beta \neq \gamma \neq 90^\circ$

3) When correlating real space with reciprocal space, what can be replaced at the question mark in the below given figure? *1 point*



- $\vec{b_3}$
- $\vec{b_2}$
- $\vec{b_2} \times \vec{b_1}$
- $\vec{b_1} \times \vec{b_3}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\vec{b_3}$

4) If $\vec{b_1}.\vec{a_2} = 0$, it implies____. *1 point*

- $I \neq J$
- $I = J$
- It is a vector dot product
- It is a Vector cross product

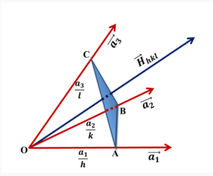
No, the answer is incorrect.
Score: 0
Accepted Answers:
$I \neq J$
It is a vector dot product

5) This is the unit vector $\hat{n} = \frac{\vec{H}_{hkl}}{|\vec{H}_{hkl}|}$ in _____ where $\vec{H}_{hkl}$ is ____ lattice vector and (hkl) is plane in _____space. *1 point*

- Reciprocal space, real, reciprocal
- Reciprocal space, reciprocal, real
- Real space, reciprocal, real
- Real space, real, reciprocal

No, the answer is incorrect.
Score: 0
Accepted Answers:
Reciprocal space, reciprocal, real

6) If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are the lattice vectors in the real space and if 'n' is the unit vector, given by $\frac{(n.\vec{b_1}+k.\vec{b_2}+l.\vec{b_3})}{|\vec{H}_{hkl}|}$ then what will be the vector dot product of unit vector and $\frac{a_1}{h}$ represent? *1 point*



- d_{hkl}
- Reciprocal lattice vector
- $\frac{1}{|h_{hkl}|}$
- Interplanar spacing

No, the answer is incorrect.
Score: 0
Accepted Answers:
d_{hkl}
Interplanar spacing

7) Let's assume $\vec{a}, \vec{b}, \vec{c}$ *and* $\vec{b_1}, \vec{b_2}, \vec{b_3}$ are the real and reciprocal lattice vectors representation respectively and if magnitude and directions of reciprocal lattice are calculated using the formula $\vec{b_i} = \frac{\vec{a_j} \times \vec{a_k}}{\vec{a_i}.(\vec{a_j} \times \vec{a_k})}$. Then what will be the volume of BCC and FCC crystal structure representation in reciprocal space. *1 point*

- $a^3/4$ and $a^3/8$
- $a^3/2$ and $a^3/4$
- a^3 and $a^3/2$
- $a^3/3$ and $a^3/6$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$a^3/2$ *and* $a^3/4$

8) What is crystal structure of Copper in real space and its representation in reciprocal space? *1 point*

- FCC, SC
- BCC, FCC
- SC, FCC
- FCC, BCC

No, the answer is incorrect.
Score: 0
Accepted Answers:
FCC, BCC

9) Diffraction condition in real space and reciprocal space are given by ___ respectively. *1 point*

- Bragg's law and Ewald's sphere construction
- Ewald's sphere construction and Bragg's law
- $2d \sin\theta = n\lambda \; and \; \left(\frac{\vec{s}}{\lambda} - \frac{\vec{s_0}}{\lambda}\right) = h\vec{b_1} + k\vec{b_2} + l\vec{b_3}$
- $2d \sin\theta = n\lambda \; and \; \left(\frac{\vec{s}}{\lambda} - \frac{\vec{s_0}}{\lambda}\right) = -2\pi(hp + kq + lr)$

No, the answer is incorrect.
Score: 0
Accepted Answers:
Bragg's law and Ewald's sphere construction
$2d \sin\theta = n\lambda \; and \; \left(\frac{\vec{s}}{\lambda} - \frac{\vec{s_0}}{\lambda}\right) = -2\pi(hp + kq + lr)$

10) Match the following in real space and its representation in reciprocal space. *1 point*

(A)	$\vec{a_1} = \frac{a}{2}(\hat{y}+\hat{z})$ $\vec{a_2} = \frac{a}{2}(\hat{z}+\hat{x})$ $\vec{a_3} = \frac{a}{2}(\hat{x}+\hat{y})$	**(i)**	$\vec{b_1} = \frac{a}{2}(-\hat{x}+\hat{y}+\hat{z})$ $\vec{b_2} = \frac{a}{2}(\hat{x}-\hat{y}+\hat{z})$ $\vec{b_3} = \frac{a}{2}(\hat{x}+\hat{y}-\hat{z})$
(B)	$\vec{a_1} = \frac{1}{a}(-\hat{x}+\hat{y}+\hat{z})$ $\vec{a_2} = \frac{1}{a}(\hat{x}-\hat{y}+\hat{z})$ $\vec{a_3} = \frac{1}{a}(\hat{x}+\hat{y}-\hat{z})$	**(ii)**	$\vec{b_1} = \frac{1}{a}(\hat{y}+\hat{z})$ $\vec{b_2} = \frac{1}{a}(\hat{z}+\hat{x})$ $\vec{b_3} = \frac{1}{a}(\hat{x}+\hat{y})$
(C)	$\vec{a_1} = a\hat{x}$ $\vec{a_2} = a\hat{y}$ $\vec{a_3} = a\hat{z}$	**(iii)**	$\vec{b_1} = \frac{\vec{a_2}\times\vec{a_3}}{\vec{a_1}\cdot(\vec{a_2}\times\vec{a_3})}$ $\vec{b_2} = \frac{\vec{a_3}\times\vec{a_1}}{\vec{a_1}\cdot(\vec{a_2}\times\vec{a_3})}$ $\vec{b_3} = \frac{\vec{a_1}\times\vec{a_2}}{\vec{a_1}\cdot(\vec{a_2}\times\vec{a_3})}$
(D)	$\vec{a_1} = a\hat{x}$ $\vec{a_2} = b\hat{y}$ $\vec{a_3} = c\hat{z}$	**(iv)**	$\vec{b_1} = \frac{1}{a}\hat{x}$ $\vec{b_2} = \frac{1}{a}\hat{y}$ $\vec{b_3} = \frac{1}{a}\hat{z}$

- A(i), B(ii), C(iv), D(iii)
- A(ii), B(i), C(iii), D(iv)
- A(iv), B(iii), C(i), D(iii)
- A(iii), B(i), C(ii), D(iv)

No, the answer is incorrect.
Score: 0
Accepted Answers:
A(ii), B(ii), C(iv), D(iii)