Unit 14 - Week 12

Assignment 12

The due date for submitting this assignment has passed. Due on 2020-04-22, 23:59 IST.
As per our records you have not submitted this assignment.

1) A 83 eV electron beam scatters from an unknown sample and a Bragg reflection peak is observed centered at 22° and the peak corresponds to first-order diffraction (n=1). What is the Bragg plane spacing? Compute non-relativistically. (Given: Planck constant, h =6.6×10^{-34} J-s) 1 point

(a) 1.17 Å

(b) 1.79 Å

(c) 2.97 Å

(d) 3.17 Å

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

2) Thermal electrons incident on a sodium chloride crystal (interatomic spacing 2.81Å) undergo first-order diffraction from the principal Bragg planes at an angle of 20°. What is the energy of the thermal electrons? Compute non-relativistically. (Given: Planck constant, h =6.6×10^{-34} J-s) 1 point

(a) 10.5 eV

(b) 20.5 eV

(c) 30.5 eV

(d) 40.5 eV

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

3) A crystalline material has a set of Bragg planes separated by 1.1 Å. For 2keV electrons, what is the highest-order Bragg reflection? Compute non-relativistically.(Given: Planck constant, h =6.6×10^{-34} J-s) 1 point

(a) 2

(b) 6

(c) 8

(d) 10

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)

4) A large crystal is used to extract single-energy neutrons from a beam of neutrons emerging from a reactor. The spacing of the Bragg planes is 1.1 Å. If the Bragg angle is set to be 30°, what is the energy of neutrons seen at this angle for a first-order reflection?Compute non-relativistically.(Given: Planck constant, h =6.6×10^{-34} J-s and mass of neutron, m = 1.67×10^{-27} kg) 1 point

(a) 0.067 eV

(b) 0.51 eV

(c) 1.25 eV

(d) 2.51 eV

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

5) X-rays are incident to (111) planesof a single cubic crystal with a lattice constant of 0.2 nm. The first-order reflection is observed at a Bragg angle of 43.5°. Calculate the wavelength of the x-rays. 1 point

(a) 0.119 nm

(b) 0.139 nm

(c) 0.159 nm

(d) 0.179 nm

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)

6) For the electron diffraction the electrons are accelerated by 844 volts and the wave associated with the electrons is diffracted from a crystal. The first-order diffraction is observed at a Bragg angle of 58°. Determine the interplanar spacing of the crystal using Bragg equation. Compute non-relativistically.(Given: Planck constant, h =6.63×10^{-34} J-s) 1 point

(a) 0.0249 nm

(b) 0.0179 nm

(c) 0.1249 nm

(d) 0.2229 nm

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a)

7) What will the shortest wavelength of continuous X-ray if the applied voltage between cathode and target is 12.4 KV? 1 point

(a) 1 Å

(b) 2 Å

(c) 3 Å

(d) 4 Å

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(a)

8) To study the direction from crystal planes, X- rays are used because: 1 point

(a) X-rays photons are of very high energy.

(b) X-rays can penetrate through many solid objects.

(c) X-rays are of very long wavelengths.

(d) Wavelengths of X-rays are of the order of interplaner spacing of crystals.

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d)

9) Calculate the glancing angle (approximate value) of the (110) plane of a simple cubic crystal (a= 2.828 Å), corresponding to the second order diffraction maximum for X-rays of wavelength λ = 0.75Å 1 point

(a) 20°

(b) 22°

(c) 25°

(d) 28°

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)

10) Monochromatic X –rays of wavelength 1Å are incident on a simple cubic crystal. The 1st order Bragg's reflection from (311) occurs at an angle of 30° from the plane. The lattice parameter of the crystal (in Å) is: 1 point

(a) 1

(b) $\sqrt{3}$

(c) $\sqrt{\frac{11}{2}}$

(d) $\sqrt{11}$

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d)

11) Electrons are accelerated by 900 V and are diffracted from a crystal. The 1st diffraction maximum occurs at 58°. Determine the spacing of the crystal. 1 point

(a) 0.2815 Å

(b) 0.072 Å

(c) 0.2417 Å

(d) 0.053 Å

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(c)

12) X –ray diffraction of a cubic crystal gives an intensity maximum for Bragg's angle of 20° corresponding to {110} plane. The lattice parameter of the crystal is: Take λ = 1.5 Å and n = 1 1 point

(a) 2.05 Å

(b) 3.54 Å

(c) 1.48 Å

(d) 3.09 Å

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(d)

13) An X-ray beam of wavelength 1.54 Å is diffracted from the {110} planes of a solid with a cubic lattice of lattice constant 3.08 Å. The 1st order Bragg diffraction occurs at: 1 point

(a) $\sin^{-1}(1/4)$

(b) $\sin^{-1}(1/2\sqrt{2})$

(c) $\sin^{-1}(1/2)$

(d) $\sin^{-1}(1/\sqrt{2})$

(a)
(b)
(c)
(d)

No, the answer is incorrect.
Score: 0
Accepted Answers:
(b)