PHYS 321 X-ray Diffraction Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| Braggs’s Law | Inter-planar Spacing | Hydrogen Like Spectra (R= 1.097 x 107 m-1) |
| $$2d\_{hkl}Sinθ=nλ$$ | $$d\_{hkl}=\frac{a}{\sqrt{h^{2}+k^{2}+l^{2}}}$$ | $$\frac{1}{λ}=RZ^{2}\left(\frac{1}{n\_{f}^{2}}-\frac{1}{n\_{i}^{2}}\right)$$ |

The 2ϴ values in degrees for first order diffraction peaks are given below for a metal with cubic structure, using X-rays from Cu-Kα radiation (Z = 29): 44.48, 51.83, 76.35, 92.9, 98.4, 121.87, 144.54, 155.51.

(a) Determine the wavelength of the X-rays used.

(b) Derive an expression for $\frac{Sin^{2}θ}{h^{2}+k^{2}+l^{2}}$ .
(c) Complete the table below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 2θ (deg.) | θ (rad) | Sin2θ | Normalize | ClearFractions | h2+k2+l2 | (hkl) | $$\frac{Sin^{2}θ}{h^{2}+k^{2}+l^{2}}$$ |
| 44.48 |  |  |  |  |  |  |  |
| 51.83 |  |  |  |  |  |  |  |
| 76.35 |  |  |  |  |  |  |  |
| 92.9 |  |  |  |  |  |  |  |
| 98.4 |  |  |  |  |  |  |  |
| 121.87 |  |  |  |  |  |  |  |
| 144.54 |  |  |  |  |  |  |  |
| 155.51 |  |  |  |  |  |  |  |

(d)Determine the crystal structure.

(e)Determine the lattice constant.
(f) Determine the ionic radius.
(g) Identify the metal.