X-Ray Diffraction

Name:

Webquest- University of Cambridge Tutorial

The University of Cambridge Department of Physics has developed an informative tutorial about fundamental concepts related to x-ray diffraction. Visit the site below. Answer the accompanying questions **in your own words**, without transferring ideas directly from the website.

http://www-outreach.phy.cam.ac.uk/camphy/xraydiffraction/xraydiffraction1_1.htm

Röntgen's 'X'-Rays

1. Röntgen described some of the properties that x-rays exhibit. List these properties:

Waves or Particles?

2. Assuming that they were waves, Wein calculated a theoretical wavelength for x-rays. Compare this value to the experimentally determined value from von Laue. If von Laue's value is 1000 times shorter than the wavelength of visible light, what is the wavelength for visible light?

3. Draw two waves with the same amplitude. Give the first have a longer wavelength.

4. Draw two waves that are in-phase. What happens when their wavefronts coincide?

Diffraction

5. Indicate the two general circumstances when diffraction occurs. Draw a sketch for each type of diffraction.

Huygen's Principle

6. Explain Huygen's principle. Use one or more rough sketches in your description.

7. What is a diffraction gratting?

Von Laue's Crystals

8. Scientists had not confirmed the wave-nature of x-rays until the work of von Laue. How did von Laue prove that x-rays had wave-like qualities?

9. Draw a rough sketch of the diffraction pattern that von Laue observed after x-rays passed through a crystal.

Lawrence Bragg in Cambridge

10. Bragg did not agree with part of von Laue's explanation for the diffraction pattern. Explain.

Bragg's Law

11. Write the equation for Bragg's law:

12. Explain the significance of Bragg's law using one or two concise sentences.

Explaining Crystal Structure

13. Sketch the **front view** of the following lattice patterns:

simple face-centered body-centered

Father and Son

14. What instrument did Lawrence Bragg use to test his hypotheses related to x-rays? Who invented the instrument?

The X-ray Spectrometer

15. What is the function of this instrument? What information does it provide that von Laue was missing?

More Complicated Crystals

16. Scientists viewed the structure of crystals differently after the Braggs solved the structure of salt. Explain.

Modern Imaging

17. List the names of the specific techniques / processes that use x-rays to determine the structure of substances.