TSOKOS READING ACTIVITY
Section 9-2

1. Essential Idea: Single-slit diffraction occurs when a wave is incident upon a slit of approximately the same size as the wavelength.

2. Nature Of Science:

   a. Development of theories: When light passes through an aperture the summation of all parts of the wave leads to an intensity pattern that is far removed from the geometrical shadow that simple theory predicts.

3. Theory Of Knowledge: Are explanations in science different from explanations in other areas of knowledge such as history?

4. Understandings: The nature of single-slit diffraction

5. Applications And Skills:

   a. Describing the effect of slit width on the diffraction pattern

   b. Determining the position of first interference minimum

   c. Qualitatively describing single-slit diffraction patterns produced from white light and from a range of monochromatic light frequencies

6. Guidance:

   a. Only rectangular slits need to be considered

   b. Diffraction around an object (rather than through a slit) does not need to be considered in this sub-topic (see Physics sub-topic 4.4)

   c. Students will be expected to be aware of the approximate ratios of successive intensity maxima for single-slit interference patterns

   d. • Calculations will be limited to a determination of the position of the first minimum for single-slit interference patterns using the approximation equation

7. Data Booklet Reference: $\theta = \frac{\lambda}{b}$

8. Utilization: X-ray diffraction is an important tool of the crystallographer and the material scientist

9. Aims:

   a. Aim 2: this topic provides a body of knowledge that characterizes the way that science is subject to modification with time

   b. Aim 6: experiments can be combined with those from sub-topics 4.4 and 9.3

10. Read section 9-2, pg. 361-364, in your textbook.

11. Answer the following questions:

a. Define diffraction.

b. For a wave passing through an aperture, what is required for diffraction to occur?

c. In this section specifically, what is meant by "diffraction is appreciable"?

d. Describe the diffraction pattern of light through an opening whose opening is the same order of magnitude as the wavelength of the light.

e. When light passes through an aperture, the diffraction pattern on the other side has areas of both light and dark. Explain why this occurs.

f. What is the condition for destructive interference in single-slit diffraction? (give both equation and description)

g. At what angles will minima occur from a rectangular opening if the light has wavelength λ and aperture length is b?

h. How do the formulae for angles above support the idea that wavelength must be comparable to the opening size for diffraction to occur?

i. What is the relationship between the size of the slit and the width of the central maximum in a diffraction pattern?

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Nature of Science:

j. What led to acceptance of the wave theory of light in the 19th century? _____

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k. The work of Fresnel followed by the work of Arago is an example of _____

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12. This assignment may be typed or neatly printed. Drawings may be freehand, but try to make use of the 'Shapes' or 'Insert Clipart" functions of MS Word. If you submit this assignment electronically, the filename must be in the following format, "LastnameFirstinitialPerXReadActX-X".