

**Study Questions for Buchwald (1989) *The Rise of the Wave Theory of Light*.**

**Chapter 3**

1. What are Newton's rings?
2. What did Arago observe about Newton's rings in 1811?
3. According to Newton, which surface of the lamina (the upper or the lower) is responsible for the formation of rings?
4. According to Arago, which surface of the lamina is responsible for the formation of rings?
5. Why did Arago think this was a problem for the emission theory?
6. What is chromatic polarization?
7. How many votes did Arago receive for his election to the Institute of Science? How many did Poisson receive?
8. According to Buchwald, what events transpired at the Institute of Science that would later affect Arago's support of Fresnel?
9. What was Arago's "unifying speculation" about the polarization of light by doubly refracting bodies?

**Chapter 4.**

1. In addition to preventing Arago from justifying his early appointment to the Institute, what further insult did Biot perpetrate on Arago?
2. How did Biot's experimental setup for detecting chromatic polarization differ from Arago's?
3. What was Biot's hypothesis concerning the incident light bundle during double refraction?
4. According to Biot, how many light bundles did his analyzing crystal receive from the doubly refracting crystal?
5. What was Biot's explanation of the phenomenon in which "...the polarization of light operators in a large number of crystals endowed with double refraction"?
6. According to Biot, what characterizes a homogeneous beam of light after it leaves a doubly refracting crystal?
7. In what sense is Biot an emissionist?
8. In what sense is Biot a selectionist?

**Chapter 5.**

1. What was calorific?
2. In the diffraction of light around a narrow object, what are "external" fringes? What are "internal" fringes?
3. Were Fresnel's first attempts to obtain formulas for diffraction based on the interactions of rays, or the interactions of wave fronts?
4. In what sense were Fresnel's first attempts at a theory of diffraction a "purely binary scheme"?
5. Why is the edge of the geometric shadow of a narrow object not of direct physical significance to a wave theory of diffraction? Why is this edge very important in a binary ray theory of diffraction?
6. What is Fresnel's Principle?
7. How is Fresnel's Principle different from Huygens's Principle?
8. Why was Arago particularly interested in anything (like Fresnel's theory of diffraction) that cast doubt on the emission theory?
9. What was the significance of Fresnel's mirror experiment of 1816?
10. What problem in 1816 confronted Fresnel's new binary ray theory of diffraction?
11. How did Fresnel's "efficacious ray" hypothesis address the problem in #10?
12. Why was the "efficacious ray" hypothesis a radical change from Fresnel's earlier theory, according to Buchwald?