

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

**Introduction**

1. What are the two historical processes that Buchwald identifies in the development of theories of light during the 19th century?
2. What is a "beam"? What is a "ray"?
3. What is the difference between emission theories of light and wave theories of light?
4. What is a wave front? How does the wave theory of light characterize a light beam?
5. What is chromatic polarization?
6. What is selectionism?

**Chapter 1.**

1. What did mechanical theories of light in the 1600s presume light to be?
2. What is Huygens's Principle?
3. What does the term "ray" refer to?
4. What happens to light passing through Iceland spar?
5. What is the "principle section" of a crystal? What is the "optic axis"?
6. How did Newton characterize light?
7. According to Buchwald, what two changes characterized research on the nature of light in 1810?
8. What is the "amplitude of aberration"?
9. According to Buchwald, why were Huygens, Haüy, la Hire, and Newton all convinced that their formulas for double refraction worked well?
10. According to Buchwald, if the fundamental requirement that formulas must connect directly to experiment didn't change between the beginning and the end of the 18th century, what did change?
11. What was the practical barrier that prevented systematic comparisons between theoretical predictions and experimental results during the 18th century?
12. What was one way to avoid computational problems with geometry in testing theories of optics in the 18th century?
13. What was Malus's theorem of 1810?
14. What was one conceptual difficulty that Malus, as an advocate of the emission theory, faced in translating Huygens's Principle into algebra?
15. How did Laplace address the difficulty in #9?

**Chapter 2.**

1. What did Malus observe in 1808?
2. How could beams of light be made to escape partial reflection?
3. What was Malus's Law of 1811?
4. What was the "imperfect analogy" that motivated Malus's discussion of the partial reflection of polarized light? Why was it imperfect?
5. In what sense are rays of light entities that retain their identities as individuals under reflection and refraction?
6. According to Buchwald, what is the selectionist's understanding of polarization?
7. What was Malus's law of proportionate polarization?
8. What was Malus's ratio law?
9. What three things must a selectionist know in order to determine how a beam of light will behave?
10. According to Buchwald, by 1810 why was an empirically successful selectionist analysis generally assumed to support the emission theory?