

Study Questions for Smith (1998) *The Science of Energy*.

Chapters 1-4.

1. According to Smith, what were the three North British sites for the construction and dissemination of the new natural philosophy associated with energy science?
2. How is the traditional view of credit in science different from Latour and Woolgar's view?
3. How does a "spiral of credibility" differ from a "cycle of credibility"?
4. What are the four phases Smith associates with the North British energy group's spiral of credibility?
5. What was the "Disruption" of 1843?
6. What is Whig history?
7. What were some of the cultural differences between the Anglican church in England and the Presbyterian church in Scotland?
8. What are some of the differences between Thomas Chalmers' "free trade" view of the world and the "free trade" view of professional economists?
9. What is the "Presbyterian economy"?
10. What was Watt's innovative modification of the Newcomen steam engine?
11. What is Leibniz's notion of *vis viva*?
12. According to Clapeyron, under what condition can the maximum amount of work be derived from the fall of heat from one body to another?
13. According to Smith, why was Joule initially unable to publish in the prestigious *Philosophical Transactions of the Royal Society*?
14. According to Smith, Joule's new theory of heat was not meant as "an abstract and speculative set of doctrines". What then was it meant as?
15. Why did Joule think the destruction of *vis viva*, which he associated with Clapeyron's theory, was unacceptable?

Chapters 5-7

1. What were the conflicting claims of Joule and Clapeyron that Thomson was faced with?
2. Why was Thomson concerned with reconciling Joule and Clapeyron?
3. What was Carnot's "general hypothesis" and why did Thomson think it caused a problem in explanations of conduction?
4. How did Joule explain conduction in a way that avoided this problem?
5. According to Smith, how was Carnot's conception of nature different from Thomson's?
6. What is the difference between a caloric theory of heat and a dynamical theory of heat?
7. What was Carnot's "fundamental principle" in Thomson's (1849) "An Account of Carnot's Theory"?
8. What were some of Thomson's doubts concerning Joule's thesis of the convertibility of heat into work?
9. According to Carnot, what was the consequence of assuming that it is *not* the case that "the maximum amount of motive power gained by the use of steam is also the maximum that can be obtained by any means whatsoever"?
10. According to Thomson, what is a "perfect thermo-dynamic engine"?
11. How did Clausius modify Carnot's assumption that the production of heat was "the equivalent of a mere transmission of heat from a warm body to a cold one, the quantity of heat being thereby undiminished"?
12. According to Clausius, what was the consequence of assuming that it is *not* the case that in an ideal heat engine, "the work depends solely upon the quantity of heat transmitted, on the temperatures, ... and not upon the nature of the substance which transmits it"?
13. According to Smith, what were the two insights that Thomson gained from Clausius and Rankine?
14. What is Proposition 2 of Thomson's "Dynamical Theory of Heat"? What was Thomson's theological and cosmological explanation for it?
15. According to Smith, what set of challenges did *Vestiges of the Natural History of Creation* present to anyone seeking to sustain a Christian perspective on man and nature?
16. According to Smith Thomson's energy principles "... fitted perfectly a presbyterian economy of nature". Explain.
17. What was the context for Helmholtz's mechanical theory of heat?
18. What are some characteristics of Helmholtz's concept of force?
19. What are some conceptual differences between Helmholtz's conservation of force principle and Thomson's conservation of mechanical energy principle?