

Directions and Questions for First Exam

The exam will consist of the two parts, for which the instructions are as follows:

Part A. Answer each of the following six questions in two to three sentences each (do not go on at length—you will *not* receive extra credit for going beyond a basic answer). Each question is worth 5 points (30 points total).

The actual questions will be drawn from those listed below:

1. What, for Aristotle, distinguishes animals from plants?
2. What feature of cells led Hooke to call them “cells”?
3. What was the main point Schwann wanted to get across in *Microscopical Researches*?
4. What would Schwann have seen as problematic about the proposal that cells form through the division of existing cells.
5. For Bichat, what two features of living organisms set them off from non-living things?
6. Why, for Bichat, is it futile to measure physiological properties like the strength of muscle or the amount of air entering the lungs?
7. What was Bernard’s attitude towards determinism?
8. What did Bernard mean by the “interior environment”?
9. How is it that, for Bernard, the activities of organisms maintain the constancy of the internal environment?
10. What happens, according to phlogiston theory, when metal rusts?
11. What view were Wohler and Liebig making fun of when they satirically proposed that yeast have bladders that look like champagne bottles and proposed “these infusoria gobble sugar, and discharge ethyl alcohol from the intestine and carbon dioxide from the urinary organs”?
12. According to Liebig, what differentiates the chemical reactions occurring in plants from those occurring in animals?
13. In what respect does Liebig view himself as in the tradition of Newton in his account of vital phenomena?
14. What were Pasteur’s two major conclusions from his research on the formation of butyric acid (butyric acid fermentation)?
15. What experimental result led Buchner to propose the existence of zymase? What did he take it to be?
16. What new research techniques allowed for the creation of modern cell biology?
17. What were two reasons researchers had to doubt the images generated by the electron microscope?
18. Why did early investigators think protein, not DNA, was the genetic material?
19. How did Crick and Watson go about developing their model of DNA?
20. Explain what was meant by “transmutation of species.”
21. What was the basis for Cuvier making the claim “Give me one bone, and I can reconstruct the entire organism”?
22. In what sense did species progress on Lamarck’s view?
23. What is Lyell’s uniformitarian principle?
24. Why is variation so important to Darwin’s proposed explanation of evolution?

25. How did Darwin characterize the relation between species and varieties?
26. What is Paley's watchmaker argument?
27. What did Darwin find so significant about the finches of the Galapagos Islands?
28. What was the key insight Darwin developed after reading Malthus?
29. What is meant by sexual selection?
30. Why does natural selection not result in the generation of optimal traits?

Parts B. Address the following two questions in an essay (35 points each).

On the actual exam, I will pick two of the following questions:

1. What is it to adopt a mechanistic view of living organisms? How would a mechanist's explanation of a living activity differ from one offered by an Aristotelian? Offer at least two examples of biological phenomena for which mechanists proposed explanations in the 19th century. Describe their explanations and what makes them mechanistic. How might an Aristotelian address the same phenomenon? What could a mechanist say in defense of their approach and against the Aristotelian?
2. In advancing his theory of the cell, Theodor Schwann considered himself to be a mechanist. What did he take to be central to being a mechanist and how did his cell theory exemplify a mechanist viewpoint? What about his account of fermentation led others to view him as a vitalist? How would Schwann go about defending the view that this account of fermentation was still mechanistic? Was he really a mechanist or a vitalist? Defend your answer.
3. Fermentation was the focus of extensive investigation by chemists and biologists in the 19th century. Describe the different views that were taken by some of the major investigators during the century (e.g., Lavoisier, Schwann, Liebig, Pasteur, and Buchner) and discuss the differing conceptions these entail of how biological phenomena should be investigated and explained. Did Buchner's discovery of cell-free fermentation settle the issue, or was there still room for differing perspectives on fermentation?
4. Write an essay in which you present yourself as the counterweight to Claude Bernard by developing the strongest argument you can make in favor of vitalism. Consider not only Bernard's arguments against vitalism but also the various arguments and evidence advanced by proponents of mechanism in the first 2/3rds of the 19th century and how a vitalist might respond. As Bernard himself did, make it clear you understand the case for mechanism, but then show why it is flawed.
5. Darwin commented on his reading of Paley that it was the only part of his college education that "was of the least use to me in the education of my mind." Why was Paley so influential on Darwin? On what did Darwin agree with Paley and on what did he disagree? On those points on which he disagreed, how would he argue that his account is better than Paley's? How might Paley have responded?
6. On his voyage on the Beagle Darwin read Lyell's *Principles of Geology*, from which he learned the principle of uniformitarianism. What is the principle of uniformitarianism and how did it apply to geology? Darwin sought to extend the principle to the attempt to understanding transmutation. What does uniformitarianism require of explanations of transmutation? How well does his theory of natural selection satisfy the uniformitarianism principle? What sort of defense could Darwin or others provide for insisting on uniformitarianism? How would scientific inquiry be different if one rejected it?