

Directions and Questions for First Exam

Bring **two** bluebooks available in the university bookstore with **nothing** written in or on them (not even your name). These may be redistributed at the time of the exam.

The exam will consist of the two parts, for which the instructions and possible questions 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 up to 5 points (30 points total).

The actual questions will be drawn from those listed below:

1. What point about the relation of cognition and brain processing was Fodor making using the example of the multiple ways to realize money?
2. What is the deductive-nomological model of scientific explanation?
3. What is a major way in which the deductive-nomological and mechanistic models of explanation differ?
4. What are the key components of a mechanistic explanation?
5. What is meant by “decomposing a mechanism”?
6. What are two major differences between deductive-nomological and mechanistic explanation?
7. How did Gall propose to link mental capacities to the brain?
8. What is meant by holism with respect to the functioning of the brain?
9. How did Broca determine the site where damage affected articulate speech specifically in Leborgne (Tan) given the size of the lesioned area when Leborgne died?
10. What is a major difference in the ways Broca and Wernicke addressed language deficits?
11. What are the main claims of the neuron doctrine?
12. What was the principal point of disagreement between Golgi and Cajal?
13. What was the main strategy Huxley employed in developing his and Hodgkin’s model of the action potential?
14. What criteria did Brodmann use to demarcate areas of the brain?
15. How could one go wrong in interpreting the lost capacity in a lesion study as showing what the lesioned area did?
16. How could one go wrong in interpreting the response elicited in a stimulation study as showing what the stimulated area did?
17. What sorts of stimuli did Hubel and Wiesel discover elicited responses from simple cells in V1?
18. How does the response to color in V1 and V4 differ?
19. How is the vision of animals and humans with lesions in the temporal cortex affected?
20. How did Mishkin, Ungerleider and Macko characterize the two visual pathways they identified?
21. What is a double dissociation thought to demonstrate?
22. What is the task at the algorithmic level in Marr’s hierarchy of three levels of analysis?
23. What is the task of computational theory—the highest level in Marr’s three levels of analysis?
24. What is meant by “top-down processing” in perception?

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

On the actual exam, I will pick two of the following questions. Write as clear and detailed essays as you can in the time allotted.

1. Defend or challenge the claim “The project of identifying and characterizing the role of different brain areas in vision (as exemplified in Hubel and Wiesel, Zeki, etc.) is just a modern-day version of phrenology.” Be sure to make clear what you are taking as the claims of phrenology, what are the goals of the research on visual processing, and then make clear why the latter does or does not fit the former. Given your interpretations, do you view such a claim as praising or blaming research identifying and characterizing brain regions involved in vision.

2. Evaluate Flourens’ claim “The entire doctrine of Gall is contained in two fundamental propositions, of which the first is, that understanding resides exclusively in the brain, and the second, that each particular faculty of the understanding is provided in the brain with an organ proper to itself. Now, of these two propositions, there is certainly nothing new in the first one, and perhaps nothing true in the second one.” Is he fair to Gall? Is he right in his assessment of Gall? Be sure to discuss the type of empirical evidence he employed to support his contentions. Does the subsequent two centuries of research support his assessment?

3. Construct a debate between Golgi and Cajal, making it clear how they differed. Discuss the nature of the evidence each had and how each interpreted it. Consider why each thought their interpretation of the evidence was superior. Offer a hypothesis as to why neither was moved by what the other said. After presenting the debate, reflect on how disagreements like this tend to be resolved.

4. Controversies between holists and localizationists have arisen several times in the history of neuroscience. What are the major differences between holists and localizationists? Focus on two episodes we have discussed and identify what sorts of evidence the advocates for each side in the debate offered for their position. How did the controversy get resolved in each case? Are controversies between holists and localizationists likely to be an ongoing feature of neuroscience, or can one of the positions be permanently refuted?

5. In studies linking MT to motion perception, three different research techniques were employed. Identify them and describe how each of these techniques works and what each, on its own, shows about the operations performed by MT. Taken individually, what are the limitations of each? How do they complement each other? How might skeptics still raise doubts about what MT itself does? Can such skeptical objections ever be fully to rest?

6. Mishkin, Ungerleider, and Macko on the one hand and Milner and Goodale advance different characterizations of visual processing in the two visual processing streams. What is the basic difference between their accounts? How could competent investigators differ in such ways? What roles do such differences play in the development of scientific inquiry? How might they be resolved in the future?

7. Following the way research was historically carried out, we focused on forward projections in the visual systems from retina to areas in temporal and parietal cortex. From at least the 1930s, researchers knew there were as many recurrent (backward) projections as forward projections. Why might they not have paid as much attention to these as to forward projections? What might be the importance of these to what organisms actually see when they look at the world? Consider areas like law and science where vision is taken to provide evidence. What might be some implications of these backwards projections for these endeavors?