CH. 10. PROBLEM SOLVING - STUDY GUIDE

1. The text states that the accomplishments of such innovators as Galileo and Euclid "seem to have sprung from their genius alone". Why is attributing their accomplishments to "intuition", "insight", or "genius" incompatible with a selectionist approach? [Hint: From a selectionist perspective, under what conditions does a response occur? How might the *nominal fallacy* come into play here?]

"PROBLEM" DEFINED

2. Read this section until after the three criteria of a problem are listed. State each of these criteria in words that make sense to you.

3. Construct an original example that meets the definition of a problem as defined here. Indicate how your example meets each of the three criteria.

4. Does answering the preceding question exemplify a problem as that term is technically defined here? Explain.

5. Does slam-dunking a basketball meet the definition of a problem for you? Justify your answer.

6. Does every occasion on which you say "67" exemplify the "same" response? Explain your answer using the technical terms, *textual response*, *intraverbal response*, and *echoic response*.

7. Give an example of each of the above types of environment-behavior relations.

8. Suppose that you are given the following math "problem:" What is 2 x 3? Is this a problem in the technical sense? Suppose that you are given this math problem: What is 27 x 34? Is this a problem in the technical sense and, if so, what is the crucial difference between these two math problems? What are the implications of this difference for whether the formal properties of a task define the biobehavioral processes involved in that task? Explain.

9. Why is giving the next prime number after 61 a problem? Is giving the next prime number after 3 a problem? Might the answers to such questions vary from one person to the next? Explain. [Note: A prime number is one that can be divided without a remainder only by unity and itself.]

10. The latency of a response is the time between the presentation of a stimulus and the occurrence of a response that is guided by that stimulus. As so defined, is the time between the questions asked in the preceding question and the occurrence of the response, e.g., "5", a latency? Explain.

MARSHALING SUPPLEMENTAL STIMULI

11. In order for a problem to be interpreted from a selectionist perspective, why is it necessary to identify supplementary stimuli? Why is simply identifying the stimuli that define the problem not enough?

12. In terms of marshaling supplementary stimuli, indicate situations in which turning your head, looking up a formula in a math book, or looking up a word in a dictionary might contribute to solving a problem. Do you see any relation between such responses and observing responses? Explain.

13. Read through the entire discussion of multiplying 362 x 784. Does this meet the definition of a problem, and why?

14. After completing the multiplication problem, how do you know whether the answer is right? Do you always know when the best answer to a problem has been achieved—i.e., when the problem has been solved? Do problems always have only one correct solution? Explain.

15. What are the supplementary stimuli when solving the math problem? What caused such stimuli to appear?

16. Consider what occurs when you try to solve the problem of the snake crawling through the rooms of the house. (See **Figure 10.1**.) Discuss the process in terms of the defining criteria of a problem and the marshaling of supplementary stimuli.

17. In general, what must occur if a problem is to be solved according to a selectionist interpretation? Must environment-behavior relations always be overt (i.e., observable by others) if the account is acceptable as a selectionist interpretation? If not, do covert relations require new principles for their interpretation? Explain.

The Status of Covert Responses

18. Criticize the following statement: Behavior may be classified into two distinct types, overt behavior and covert behavior, with each describable by its own scientific principles—behavioral principles in the first case and cognitive principles in the second.

19. Which is the "real" response, the overt behavioral response or the covert neural response? Explain.

20. Why is it said that "most analysis of complex human behavior is interpretation and not basic science"? Do you agree? What are the implications of this view for the study of human behavior?

21. What are the similarities and differences between sensing a stimulus and reafference? Which should occur most rapidly, environmental stimuli produced by overt observing responses or covert stimuli produced by reafference? (See **Figure 10.2**.) What are some of the implications of this for the guidance of behavior?

22. Comment on the following: Just as cognitive psychology infers underlying cognitive processes, so selectionists infer underlying covert processes. The only difference between cognitivists and selectionists is in the language that they use to describe the underlying processes. The different terms really refer to pretty much the same thing.

THE EXPERIMENTAL ANALYSIS OF PROBLEM SOLVING

23. For what reasons are relatively simple problems usually studied in the laboratory?

The Role of Response Variability in Problem Solving

24. What is trial-and-error problem solving? Which of the three steps in a selectionist account of the origins of complexity is emphasized in this type of problem?

25. What aspects of problem solving seem to be neglected by the trial-and-error account?

26. What is the function of variation in problem solving?

Stereotypy and Variability

27. What are some of the sources of variation—are some innate, are some acquired?

28. To what characteristics of behavior does stereotypy refer?

Reinforcement and stereotypy

29. Based upon experimental work, what may occur when the behavior required to produce a reinforcer is not severely limited by the contingencies of reinforcement (i.e., the reinforced behavior can assume different topographies)? Account for this result in terms of selection by reinforcement. Relate the result to earlier work on superstitious behavior.

30. Schwartz found that subjects with a history of reinforcement for specific responses were less likely to find the general rule. May we conclude from this result that reinforcement generally hinders problem solving? Explain.

Extinction and variability

31. What are the effects of extinction on variation in behavior? (See **Figure 10.3**.) Indicate how this might come about. [Hint: What happens to the *prepotent response* during extinction?]

Selecting for variability

32. Does reinforcement necessarily decrease variation in behavior? Make reference to experimental work in your answer.

The deleterious effect of instructions on response variability

33. Is behavior that is guided by instructions a different "kind" of behavior from that guided by discriminative stimuli resulting from a direct history of reinforcement (i.e., from contingency shaping)?

34. Suppose that some behavior occurs as the result of an instruction that the person has never heard before. Can this behavior be interpreted as the outcome of a history of reinforcement? Explain.

35. What effect do instructions typically have on the variation of behavior? Must instructions always have this effect?

Stereotypy and mental set

36. What is f_____ f_____? Describe a laboratory procedure and result that illustrate this phenomenon.

37. Is *functional fixedness* always produced by a history of selection by reinforcers? Support your answer with experimental evidence. (See **Figure 10.4**.)

Maier's Two String Problem

38. What is the *two-string problem* (see **Figure 10.5**), and what are the typical findings when a subject is confronted with this task?

39. What are some of the variables that importantly affect finding a solution to the t____-s_____ problem? Support your answer with experimental evidence. (See **Figure 10.6**.)

40. Interpret the solution of the two-string problem using the technical terms *resurgence* and *automatic chaining*. (See **Figure 10.7**.)

The Role of Acquired Reinforcers in Problem Solving

41. What are the characteristics of problems that cannot be solved by variation in behavior alone? Give an example of such a problem.

42. What are the characteristics of problems that can be solved by *codified strategies*? Give an example of a problem that can be solved by c_____ s_____.

43. What is the major function that *acquired reinforcers* play in problem solving? [You may be better able to answer this question after reading the entire section.]

44. Three general behavioral repertoires are identified for aiding problem solving: These are: m_____-e____ a_____, w_____ b_____, and b_____ a p_____ into p_____.

Means-end analyses

45. Give an example of m_____-e_____ analysis. Clearly indicate how the example illustrates this approach to problem solving.

Working backward

46. Give an example of w_____ b_____. Clearly indicate how the example exemplifies this approach to problem solving.

Breaking a problem into parts

47. Give an example of _____ a _____ into _____, clearly indicating how it exemplifies this approach to problem solving.

48. Discuss the role of acquired reinforcement in each of the three preceding approaches to problem solving.

Evidence from the animal laboratory

49. Describe examples from the animal laboratory of the role of acquired reinforcers in the maintenance of behavior with delayed reinforcers. (See **Figures 10.8** and **10.9**.) Did these animals solve a problem? Explain.

50. Comment on a difficulty often found with educational contingencies in the light of what is known about the role of acquired reinforcers in problem solving.

The Role of Insight in Problem Solving

51. In everyday terms, describe the behavior to which the term *insight* is applied. What sort of difficulty does this behavior seem to present for a selectionist interpretation?

52. Describe some of the examples of insightful behavior observed by Kohler in his studies with chimpanzees.

53. What is wrong with the following statement? The genius ape Sultan solved the problem because he had insight. [Hint: Do you recall the n_____ fallacy from Chapter 6?]

54. Describe experimental findings by Birch and Schiller that indicate that insight is not simply an innate capacity possessed by some learners and not others.

55. Do the preceding experiments explain—i.e., provide an interpretation of—insightful behavior? If something is missing, what is it?

56. Surprisingly, the reading claims that pigeons are particularly well suited as subjects for the experimental analysis of the insightful behavior of chimpanzees. Why is this claim made?

57. Describe the methods, findings, and interpretation of Epstein's studies on the origins of insightful behavior in pigeons. (See **Figure 10.10**.) In terms of the earlier discussion of interpretation in Chapter 5, Epstein's experiments provide an example of an o_____ interpretation of Kohler's insight experiment.

58. Training procedures that did not produce insightful behavior in pigeons are also described. What do the results of these procedures tell us about the general requirements for the interpretation of insightful and other complex behavior?

59. Epstein is said to have proposed a "moment-to-moment account" of insightful behavior. What is a "moment-to-moment" account, and why is such an account required for an experimental analysis according to a selectionist perspective? [Hint: Consider discriminative stimuli, discriminated responses, and reinforcing stimuli in your answer. Compare with the discussion of molecular and molar accounts of behavior on pp. 112 ff.]

60. Why is it important for the understanding of complex behavior to give an interpretation of both "correct" and "incorrect" responses?

61. Do the experiments with pigeons "explain" insight in humans? If not, why not?

62. Are appeals to covert stimuli and responses in the interpretation of complex behavior equivalent to an appeal to "cognitive" processes? Explain your answer making use of information from the earlier part of the chapter in which the place of covert events in biobehavioral accounts was discussed.

CONCLUSION

63. Selection by reinforcing stimuli brings specific responses under the control of specific stimuli (those stimuli and responses present at the moment of selection). How do you reconcile this effect of selection, which reduces variation in responding, with the view that variation in environment-behavior relations is essential for the emergence of complex behavior?

64. From a selectionist perspective, what about highly skilled or complex behavior encourages us to attribute such behavior to entities inside the person—e.g., to "talent", "genius", or "intelligence"—rather than to the cumulative effect of the environment?

65. Comment on the view that genius is 90% perspiration and 10% inspiration in the light of Newton's and Gauss' remarks on the origins of their remarkable accomplishments.