**1. Describe an experimental procedure you could use to study blocking in humans (other than the category-learning procedure discussed in the text). Be sure to indicate what outcome would signal that blocking had occurred.**

Subjects are presented with jelly beans in two bowls and asked to choose one to eat. One bowl will contain bad-tasting jelly beans (e.g., Bertie Bott’s earwax-flavored beans), while the other will contain ones that taste good (e.g., watermelon). Initially, the color of the candies will indicate which one is good and which is bad. For example, the earwax-flavored jelly beans are white, while the watermelon-flavored ones are dark green. After a training period, the bowls will additionally indicate which jelly bean is noxious. For example, the bad jelly beans could be presented in a red bowl, while the pleasant ones could be presented in a blue bowl. Finally, in the testing phase, the jelly bean flavors would be changed. Pleasantly-flavored jelly beans would still be presented in the blue bowl, but would no longer be dark green. Bad tasting jelly beans would be presented in the red bowl, but would no longer be white. If participants draw from the two bowls randomly (indicating that they have not learned the rule that the red bowl contains bad jelly beans), then blocking has occurred.

**2. How does the Rescorla-Wagner model account for the phenomenon of blocking?**

In the Rescorla-Wagner model, learning is dependent on prediction error. In a situation leading to blocking, the original CS (e.g., the light in the classic rat shocking experiment) is sufficient to accurately predict the US (the shock). In this case, there is no error in prediction, which means that there is no reason to update the associations between the CS, US, and any other provided predictors of the US. In essence, no new learning will occur when there is no prediction error, which would explain why, when an additional predictor is added to the presentation of a pre-trained CS, and both are equally sufficient to predict the US, the organism is not likely to learn an association between the new stimulus and the US (i.e., blocking).

**3. Explain delay conditioning and trace conditioning. Also, indicate what is the typical result of varying the ISI in a delay conditioning experiment (include a drawing).**

Delay conditioning involves presenting a continuous CS that ends immediately prior to the US. In trace conditioning, the CS is presented (and ends) prior to the US, with a delay between the cessation of the CS and presentation of the US. Extremely short (<250 ms for the eyeblink task with a rabbit) or extremely long (>250 ms) ISIs make learning more difficult for the animal, requiring more trials for successful learning to occur.

**4. Explain how operant conditioning is different from classical conditioning.**

Operant conditioning involves decision-making on the part of the animal. Specifically, the outcome in operant conditioning only occurs if the animal makes a specific response to the stimulus. In classical conditioning, the outcome (unconditioned stimulus) occurs after/concurrently with the stimulus (conditioned stimulus) regardless of what the animal does.

**5. What is a secondary reinforcer? Give an example.**

A secondary reinforcer is an outcome without inherent value (unlike primary reinforcers like sleep, food, water, etc.). An example is bitcoin, which can be used to obtain primary reinforcers.

**6. What is the role of the dorsal striatum in operant conditioning? Discuss one piece of evidence to support your claim.**

The dorsal striatum is important in learning relationships between stimuli and necessary responses based on outcomes, but is not necessary to learn the overall relationship between response and outcome (ignoring the stimuli which affect the response-outcome relationship). For example, rats with dorsal striatal damage can correctly associate a lever press response with a food pellet outcome, but cannot associate the presence of a light stimulus with the effect of the response on receiving the outcome.

**7. Explain how timing of a reward (delay between a response and a reward) and probability of a reward (how often the response is rewarded) affect operant conditioning and choice.**

The delay between response and reward is negatively correlated with learning rate; as the delay becomes longer, the association takes longer for the animal to form. A similar relationship exists between probability of reward and learning rate. If a given response is less likely to induce a reward, the animal will learn the association more slowly. These associations also hold for choices, in that an animal becomes less likely to produce the response that causes the outcome as the delay between response and reward increases and as the likelihood of reward based on response decreases.