The following questions pertain to various issues involving scientific explanation.

1. Read the following description of a case, and then answer the each of the following two questions:

   We have a sample of gas in a cylinder with a movable piston at constant temperature. The pressure of the gas is equal to 1 atmosphere at 9:14am. The volume of the gas at that time is of 1 cubic foot. Boyles law of gases states that, at constant temperature, the pressure of a gas is inversely proportional to its volume. At 9:15am, we apply an additional pressure of 1 atmosphere making the total pressure on the gas 2 atmospheres. As a result, the volume of the gas decreases to 1/2 cubic foot at 9:15am.

   (a) How would Hempel explain the fact that the volume of the gas decreased to 1/2 cubic foot at 9:15am? Be sure to explain why this explanation satisfies Hempels requirements for this sort of explanation. (To answer this, you will need to describe Hempels theory of this sort of explanation.)

   (b) Can one make use of the fact that the volume of the gas decreased to 1/2 cubic foot at 9:15am to produce an argument satisfying all the requirements on D-N explanation to the conclusion that, at 9:14am, before we applied the additional pressure, the gas was under a total pressure of 2 atmospheres? Would that be a problem for Hempel's D-N model of explanation? [Hint: Consider the question of whether the fact that the volume of the gas decreased to 1/2 cubic foot at 9:15am, after we applied an additional pressure of 1 atmosphere, explains the fact that the gas was under a total pressure of 2 atmospheres at 9:14am, before we applied the additional pressure.]

2. Read the following description of a case, and then answer the following two questions:

   Freddy is a fruitfly. Both of his parents have red eyes. Each one of them has a dominant red-eye gene and one recessive red-eye gene. Genetic theory (let us suppose) tells us that (a) the probability that Freddy has red eyes, given his parentss genes, is 0.75; and the probability that he has white eyes, given his parentss genes is 0.25.

   (a) Suppose Freddy has red eyes. How would Hempel explain this fact? Be sure to explain why this explanation satisfies Hempels requirements for this sort of explanation. (To answer this, you will need to describe Hempels theory of this sort of explanation.)

   (b) Suppose Freddy has white eyes. What difficulties would Hempel have to explain this fact? How would the Statistical-Relevance (S-R) model of explanation explain this fact?

3. Briefly explain the flagpole example (Salmon, p. 50) and the man and the pill example (Salmon, p. 47). Why do these examples present difficulties for Hempels D-N model of explanation? Can you think of an improvement on the D-N model that would be able to accommodate these examples? Would such an improvement be able to deal with the following example?

   > On the carpet, near the desk in Professor Jones's office, is an unsightly black stain. How does he explain it? Yesterday, an open bottle of black ink stood on his desk, near the corner. As he went by he accidentally bumped in with his elbow, and it fell on the floor, spilling the ink on the carpet. [Hint: this seems to be an OK explanation; nevertheless, it does not incorporate any *laws*.]

4. Reconstruct Van Fraassen's "pragmatic" why-question approach to explanation. Critically evaluate Salmon & Kitcher's critique of Van Fraassen's account. Are they accurate in their reconstruction? If not, can you suggest an alternative way to reconstruct Van Fraassen's account which avoids the difficulties raised in Salmon's discussion? [see Salmon, pages 135–150]