Question 1  The speed of light through a transparent substance is $2.00 \times 10^8$ m/s. What, probably, is the substance?

The most obvious strategy here for identifying the substance is to find its index of refraction and compare with the table of $n$ values given in the textbook.

$$n = \frac{c}{v} = \frac{3.00 \times 10^8 \text{ m/s}}{2.00 \times 10^8 \text{ m/s}} = 1.50$$

Comparing with the values in the table, we note that both glass and benzene have $n$ values of 1.50. So, in the absence of any other hints, the substance could be either glass or benzene.

Question 2  In the diagram below, a block of some substance is immersed in water. The path of a light ray is shown. Is the index of refraction of the block less than that of water or more than that of water? Explain how you know.

The light is bending toward the normal as it enters the block. The only way for that to happen is for the index of refraction to increase: the substance has an $n$ value more than that of water.

Question 3  In the section “A closer look,” a figure shows two lenses. One is a converging lens and the other is a diverging lens. Draw a diagram showing what the path of the rays would be if these lenses were not pieces of glass in air, but rather were bubbles under water in the same shapes.

As the diagram shows, the “lenses” do just the opposite of what their glass-in-air counterparts do. The double-convex lens is a diverging lens, while the double-concave lens converges the rays.
Question 4 In the lab, we covered a lens with a half-dozen pinholes in a piece of foil. Describe what happened to the images of the light bulb filament, when we moved the screen toward and away from the lens.

Sorry! This is a duplicate of a question on the previous homework set.

Question 5 How would you describe the character qualities of Galileo’s son, Vincenzio, when he was in his teens? (Reference the section of Galileo’s Daughter on which you base your answer.)

He seems at age 17 to be “the sullen, thankless opposite of his industrious older sister” (Sobel, p. 119). At college in Pisa, he was not careful with money and severely tried the goodwill of Galileo’s friend who was supposed to look after him. Overall, not a son to be proud of. He seems to have matured somewhat by the time he married.

Question 6 What was the point of Galileo’s “parable” of the cicada, in his pamphlet The Assayer?

The main point seems to be that though men may understand a great many of the workings of nature, those workings are so deep and varied that men can never learn all. A corollary is that the more men learn, the more they ought to be humbled by the marvelous workings of the Creator.

Question 7 What was the recurring problem troubling the Poor Clares, about which Maria Celeste asked her father to speak to the Pope? In the context of answering this question, describe those who were “more suited to hunting rabbits than guiding souls.”

They had trouble getting quality priests to administer the sacraments and perform other rites which women were not allowed to perform. The “fathers” they were assigned were often abysmally ignorant and uneducated; moreover, they often lacked the moral fiber necessary to properly act the part of a priest to a company of women, often taking advantage of their authority in improper ways. Since the fathers were supposed to be paid for their services, the convent ended up in debt to them, and some of the priests took advantage of this; forcing the sisters to allow them to dine with the nuns and, as Maria Celeste puts it, “fraternize with several of the nuns.” Maria Celeste asked Galileo to intercede with the Pope so that they would be sent confessors of a higher quality and those which were truly pious, educated in the doctrines of the church and the customs of the convents, and not greedy for money and other favors. She even suggested a particular order of monks, from the Reformed Carmelites of Santa Maria Maggiore.