PREPARATION

1. Prepare your notebook for recording observations at each step of the procedure.
2. Predict the characteristics of the product that will be formed when the acetic acid is added to the milk. Record your predictions in your notebook.

PROCEDURE

1. Pour 125 mL of nonfat milk into a 250 mL beaker. Add 20 mL of 4% acetic acid (white vinegar).
2. Place the mixture on a hot plate and heat it to 60°C. Record your observations in your lab notebook, and compare them with the predictions you made in Preparation step 2.
3. Filter the mixture through a folded piece of paper towel into an Erlenmeyer flask, as shown in Figure C.
4. Discard the filtrate, which contains the whey. Scrape the curds from the paper towel back into the 250 mL beaker.
5. Add 1.2 g of $NaHCO_3$ to the beaker and stir. Slowly add drops of water, stirring intermittently, until the consistency of white glue is obtained.
6. Use your glue to fasten together two pieces of paper. Also fasten together two wooden splints. Allow the splints to dry overnight, and then test the joint for strength.

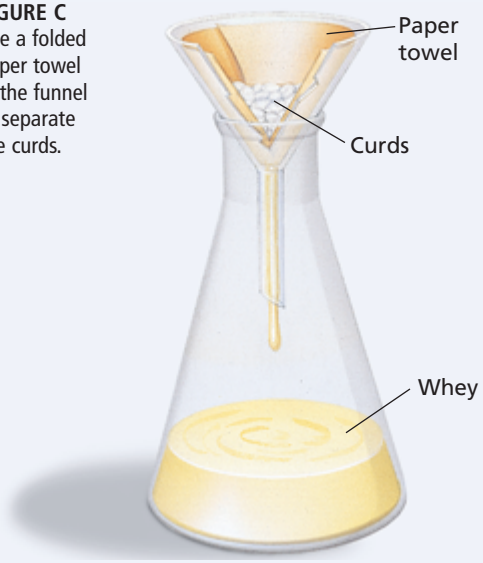
CLEANUP AND DISPOSAL

7. Clean all apparatus and your lab station. Return equipment to its proper place. Dispose of chemicals and solutions in the containers designated by your teacher. Do not pour any chemicals down the drain or in the trash unless your teacher directs you to do so. Wash your hands thoroughly before you leave the lab and after all work is finished.

ANALYSIS AND INTERPRETATION

1. **Organizing Ideas:** Write the net ionic equation for the reaction between the excess acetic acid and the sodium hydrogen carbonate. Include the physical states of the reactants and products.

FIGURE C
Use a folded paper towel in the funnel to separate the curds.



2. **Evaluating Methods:** In this experiment, what happened to the lactose and fat portions of the milk?

CONCLUSIONS

1. **Inferring Conclusions:** Figure A shows that the net charge on a protein is negative at pH values higher than its isoelectric pH because the carboxyl group is ionized. Figure B shows that at the isoelectric pH, the net charge is zero. Predict the net charge on a protein at pH values lower than the isoelectric point, and draw a diagram to represent the protein.

EXTENSIONS

1. **Relating Ideas:** Figure B represents a protein as a dipolar ion, or zwitterion. The charges in a zwitterion suggest that the carboxyl group donates a hydrogen ion to the amine group. Is there any other way to represent the protein in Figure B so that it still has a net charge of zero?
2. **Designing Experiments:** Design a strength-testing device for the glue joint between the two wooden splints. If your teacher approves your design, create the device and use it to test the strength of the glue.