Skill Module: Identifying and Correcting Mistakes Made in a Biology Lab

To be able to follow lab instructions well is one thing, but a successful researcher understands why he or she does what the experiment protocols ask. Below are situations a student might encounter in a biology lab. In this skill module, you, as the student researcher, must analyze the problems and determine either what went wrong or might occur in each situation. You'll probably come across some terms you are not yet familiar with, but use lab manuals, textbooks, and internet resources to learn about these techniques and pieces of equipment.

1. The protocol for an experiment you're performing tells you to set up samples for polymerase chain reaction, PCR. It seems that you have all the buffers and other ingredients on the materials list, but the instructions call for a forward primer and a reverse primer set. You choose a tube in the refrigerator labeled ACT1-F to be the forward primer, but the tube labeled ACT1-R, the reverse primer, appears to be empty. You see a tube with another reverse primer, MBP1-F, and decide to use that instead. Why won't this give you the results you want? To answer this question, you'll need to understand PCR, the roles primers play, and what actually happens to the DNA in your samples when it undergoes PCR.

2. An experiment calls for you to make an agarose gel to view your end results. The ingredients you use to do that include TAE buffer, agarose powder, and ethidium bromide. You find that another student has made the TAE, and the agarose is in the cabinet. You dissolve the agarose in the TAE and are about to add the ethidium bromide (EtBr), but suddenly you remember from biology class that this was an example of a carcinogen, and causes harm to DNA when it inserts itself between base pairs. What might happen to your gel if you do not add the EtBr? To answer this question, you'll need to understand gel electrophoresis and think about what you must do to see your results after the gel runs.

3. You slept in on the morning that your lab director gave the lesson on aseptic technique. When you come in later that afternoon to perform this week's experiment, the first thing you do is put your backpack on the first empty lab table you see. You take out the protocol you are going to be working with and put on your gloves. Following the instructions, you use a pipette to transfer food medium into a test tube, then you put the pipette down on the counter. You go to the fridge to find the plate with the cells you want to grow in your test tube, and walking back to your table, you see an inoculation loop no one appears to be using. You open the lid to the plate and use the inoculation loop to pick up a colony of cells and move it to the test tube. You cover the tube with a piece of Parafilm and poke a hole in the top with the pipette you used earlier. You place the tube in a shaking incubator overnight, but when you come in the next day, the cells do not appear to have grown at all. After another day, there is still no change. What went wrong? To answer this question, you'll want to know about aseptic technique, culture growth in liquid medium, and any equipment that was used. Be sure to note all occasions of mistakes that were made during the experiment.