

ANTIGEN BINDING GAME

Target age group: 10 and up

Number of players: 2 to 4 (for more players, make more than one copy of the game)

Time needed to play: 15-30 minutes (you can set your time limit)

Prep time: 30-60 minutes per game, depending on how fast and how accurately you can cut and whether more than one person is helping to cut antibodies. This does not include time spent copying/printing pattern pages.

You will need:

- Copies of these pattern pages printed onto heavy card stock
- A plastic bag for the Ig's
- A washer (if you don't have one, you could use some paper circles with punched holes)
- A paper fastener
- Scissors
- Something sharp enough to make a hole in the lightweight cardboard (nail or X-Acto knife is best, but tip of a scissor might do if you are patient and you twist it a lot)
- Lightweight cardboard such as a large cereal box or gift box (corrugated can work if you use an X-acto)
- Glue: White glue will work if you don't use too much. Spray adhesive is best (but be careful not to breathe it!)

How to prepare:

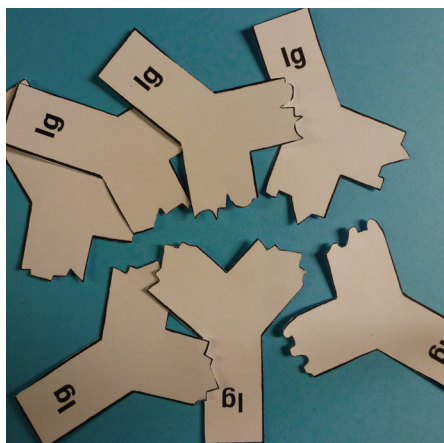
Print the pattern pages onto heavy card stock. For each group of 2 to 4 players you will need one copy of the spinner, one copy of each of the Ig pages, one copy of the vaccine cards (double sided with the word vaccine on one side and the pictures of the Ig's on the other), and two copies of each of the antigen pages. If you are playing with a large classroom, make multiple copies of the game and divide the class into small groups of 2-4 players. If you want to avoid getting game parts mixed up (this could be a nightmare with the Igs!) consider printing each game onto a different color paper. So you'll have a white game, a yellow game, a green game, etc. Clean up will be easy and you won't have to worry about teams sitting next to each other getting parts mixed up.

Cut the antigen cards in half along the line. Split them into two sets of A-H and set aside.

Cut the vaccine cards apart and put them into a pile with the word VACCINE facing up.

Cut out the Ig's (antibodies). YOU NEED TO CUT VERY ACCURATELY. If you want to shorten the task, you can cut out only one of the end patterns. It looks nice to have them both cut out, but if you are short on time and are looking for a shortcut, you can cut only one side. Just cut an approximate line around the other one. Again, accuracy in cutting those Ig patterns is VERY important!

Glue the spinner page to a piece of lightweight cardboard. Cereal box cardboard is okay. You can use corrugated cardboard if you have something adequate to cut it with (like an X-Acto knife). Cut out the large square. You DON'T need to cut around the circle. Then cut out the spinner arrow. Punch a small hole in the center of the arrow and in the center of the large square. Take a pencil and round out the hole in the arrow a bit so the paper fastener will turn freely in the hole. Put the paper fastener through the arrow, then through the washer, then through the square. Secure on the back by spreading the forks. (You will probably have to fiddle with the spinner to get it to spin freely. Wiggle the arrow to wear out the center hole a bit. Keep checking how it spins and just keep wiggling until it spins nicely.)



This game was copied onto yellow paper and the spinner arrow was painted orange. You can add color to your game or leave it white.

Background information you need to know:

This game assumes that the players have been studying the immune system to at least some degree and are familiar with what an antibody is. However, just to make sure they are all on the same page, you might want to read this aloud before playing the game:

*Our bodies have many different ways to protect us against bacteria and viruses. One of these ways is to use tiny proteins called **antibodies**. Another name for antibodies is immunoglobulins, which is often abbreviated as “Ig.” You can use the words antibody, immunoglobulin and Ig interchangeably. They all mean the same thing. The antibodies in this game are labeled with the letters “Ig.” You may have heard other letters being used with the letters Ig, such as IgE or IgG. The antibodies in this game could be either of these. The antibodies in this game look like Y’s with a shape pattern on the ends of each Y branch. In real life, antibodies do look like Y’s and they do have shape patterns on their tips. So this game simulates reality pretty well!*

Antibodies are made by white blood cells called B cells. Each B cell makes only one type of antibody, so all its antibodies will have exactly the same shape. The antibodies in this game must have been made by different B cells because they are all different shapes. Your body has millions of B cells, each one making a unique shape.

*Foreign substances that enter your body, such as bacteria or viruses, or even dust and pollen, are called **antigens**. In this game, our antigens are anything that the body does not recognize as “self.” The antigens are “not self” and therefore might be dangerous. Your body wants to get rid of them. The antibodies are designed to stick to the antigens like little flags, marking them for destruction by other immune cells such as macrophages.*

As you can see by looking at your antigen cards, antigens also have shapes. Your cards show just part of the antigen. It looks as though all these antigens are circles. In real life, or course, the antigens could be many different shapes. But this is a game, so circles will be just fine. The molecules on the outer surfaces of the antigens create patterns. Hopefully, there will be antibodies that just happen to have shapes that match a spot on an antigen. This is a random process. Your body makes millions of antibody shapes, hoping that at least some of them will find a match. Most of your antibodies will never be used! The few who do find a match will go on to duplicate themselves through mitosis, and each of those clones will make hundreds of thousands of copies of that particular antibody.

The object of this game is to find antibodies (Ig’s) that match part of an antigen.

OPTIONAL: You can read this bit on vaccines if it is helpful:

Vaccines are not a cure for a disease. They simply give your body a head start on finding antibodies that match that virus or bacteria. A vaccine puts a small amount of that pathogen (often pathogens that have been killed or weakened so they can’t make you sick) into your body so your immune system can find the antibodies that match it. This information is stored in B memory cells. Then if you are ever truly exposed to this pathogen, your body will already know how to fight it. Your body still has to fight, but it has a huge head start.

How to play:

If you have two players, they will play against each other. If you have four players, two will be on each side. For three players, you will have a one-person team and a two-person team; it will work out okay. (Or you could make three sets of cards, one for each player.) As stated before, for large classrooms, make multiple copies of the game and divide up into small groups to play.

Another option would be to make a set of antigen cards and a set of antibodies for each player (or one set per two players). If you have older students that can cut their own antibodies, you might want to consider this option. Just make sure you make each set of antibodies a different color so you can be sure not to get the sets mixed up.

Each player/team receives a set of antigen cards. The Ig’s, vaccine cards, and spinner are set in the middle between the players/teams.

There are two antibody shapes that match each antigen, plus there are two extra antibodies that don’t match any. Choose which player/team will go first.

The first player/team spins the spinner. Make sure all players can see what it lands on. If not, call it out loud. Both players/teams find that antigen card and put it on top of the stack. They then begin to search through the Ig's, trying to find one that matches that antigen. The first player to get a match says, "Match!" and that round is immediately over. That player/team keeps that Ig, thus removing it from the available pile. All other Ig's are returned to the supply pile. Make sure they are "shuffled."

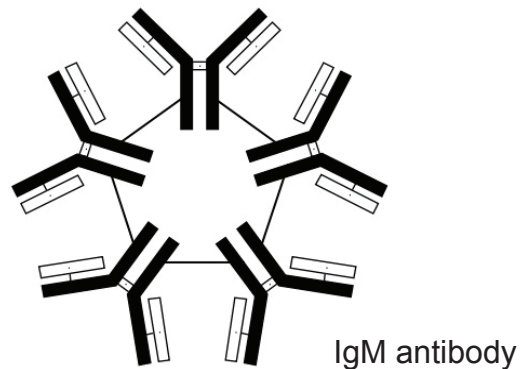
Then it is the other player/team's turn. They spin; if it lands on an antigen, the same routine is followed. The first player/team to find a match gets to keep that Ig and the rest are returned to the supply pile.

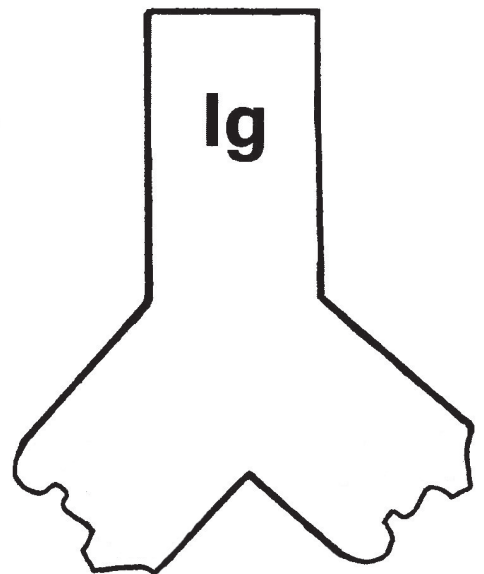
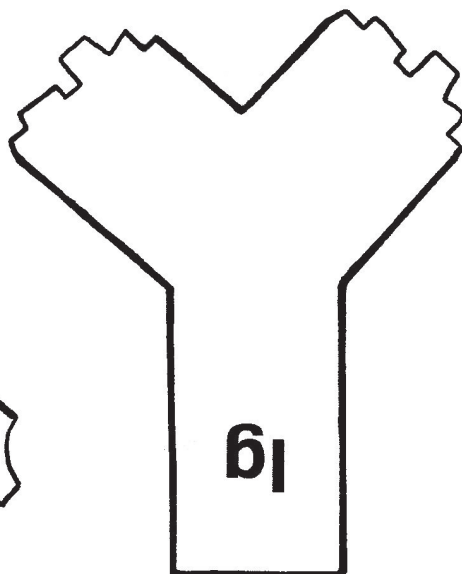
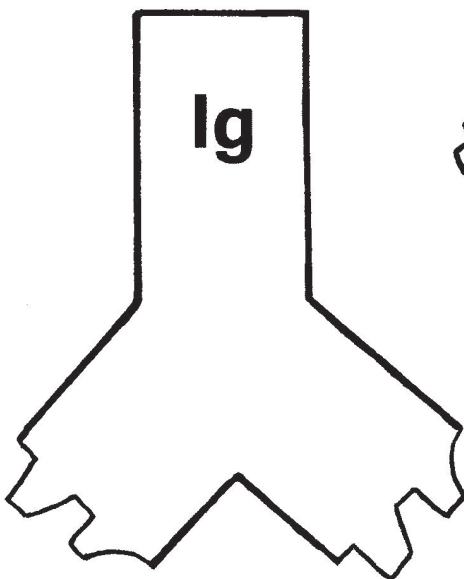
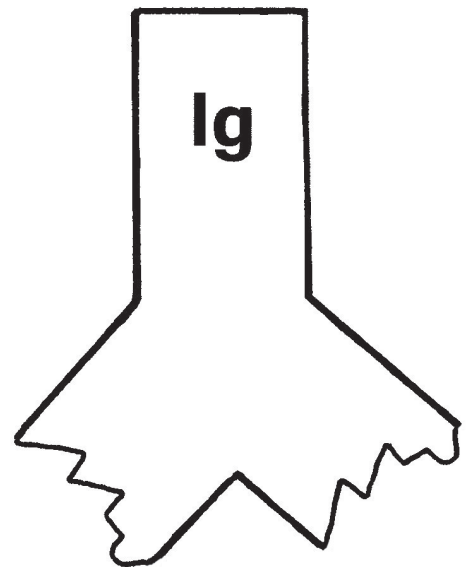
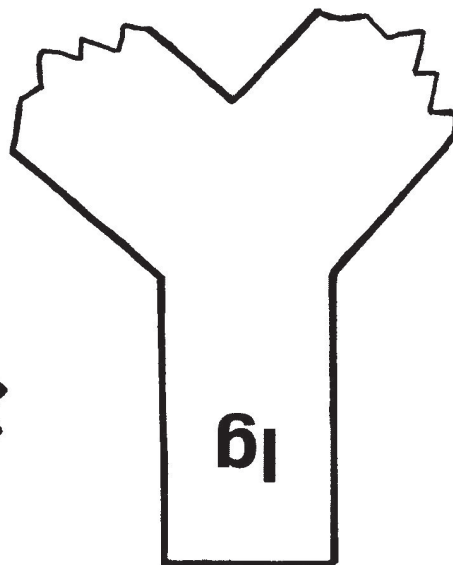
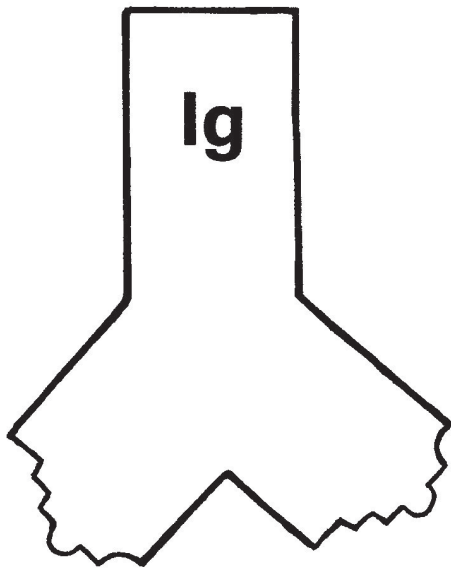
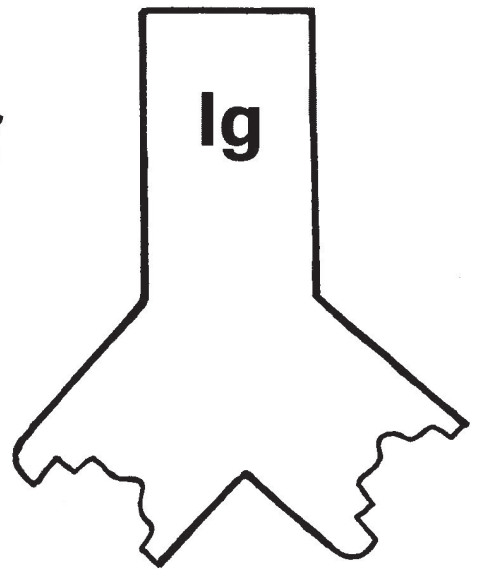
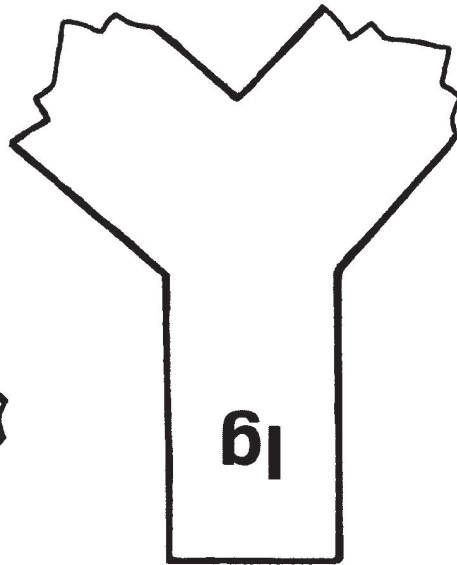
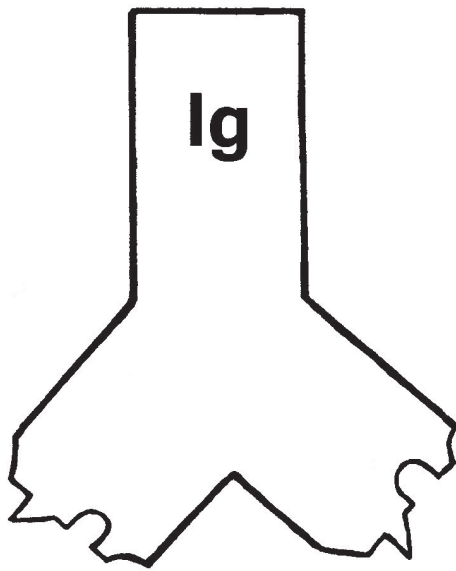
When the spinner lands on 'vaccine' that player/team takes a vaccine card. They are allowed to familiarize themselves with the shape, then they set the card aside, face down so the other player/team cannot see it. It should be kept secret. The player/team with the vaccine card will use the card the next time that antigen letter is spun. The vaccine card will give them a huge head start in finding a matching antigen. If it turns out that the matching antigen has already been removed from the game in a previous round, the player/team with the vaccine may "steal" the Ig from their opponent and use it to get the match. If they pick up a vaccine card and that Ig is already in their growing IgM, they may draw a new vaccine card.

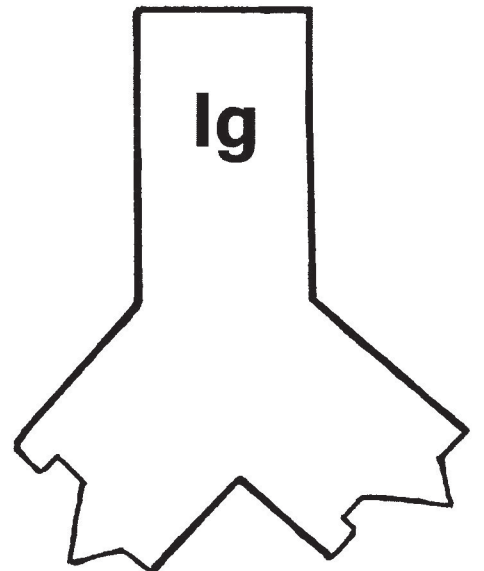
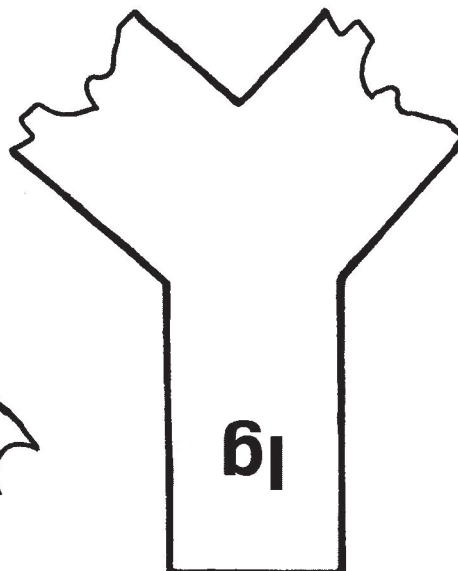
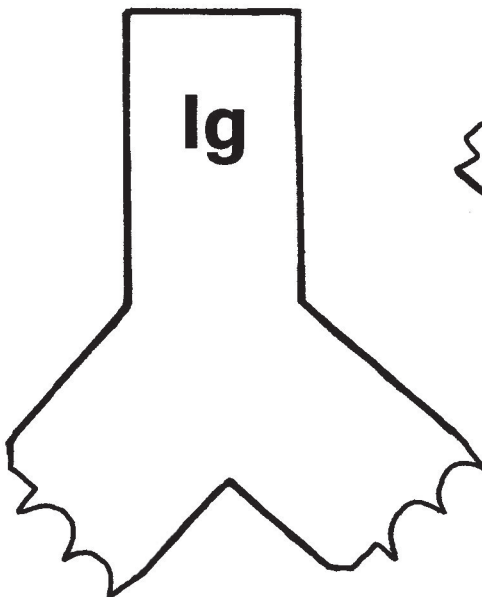
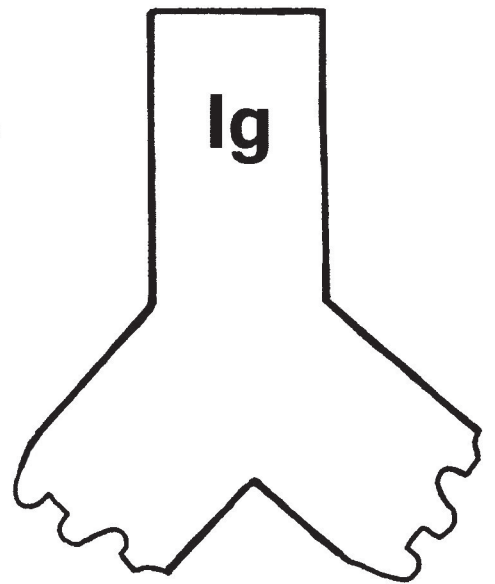
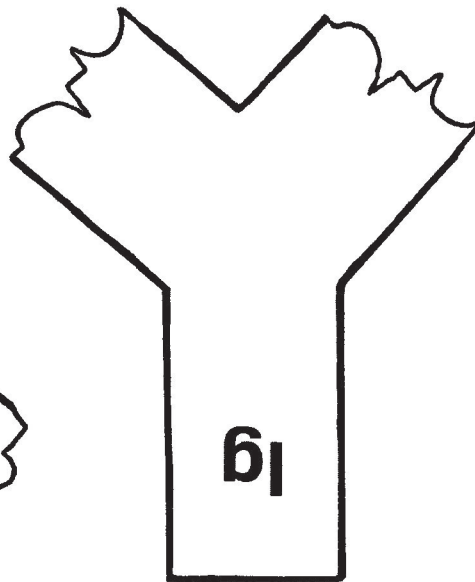
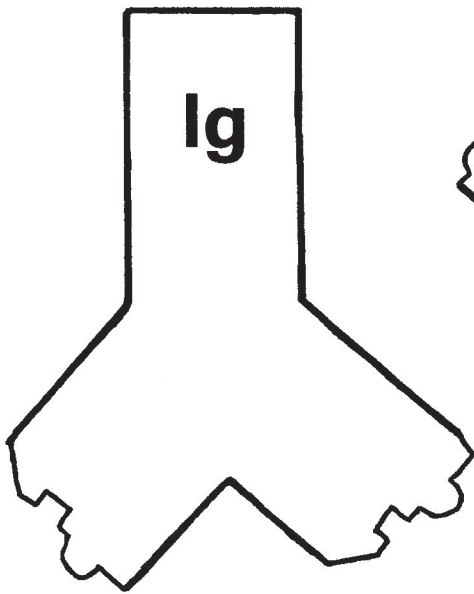
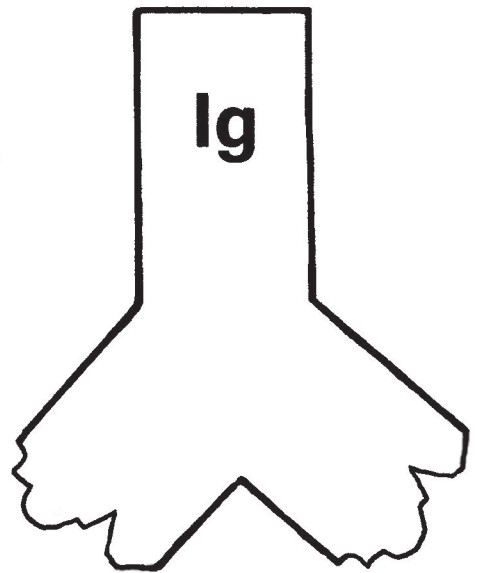
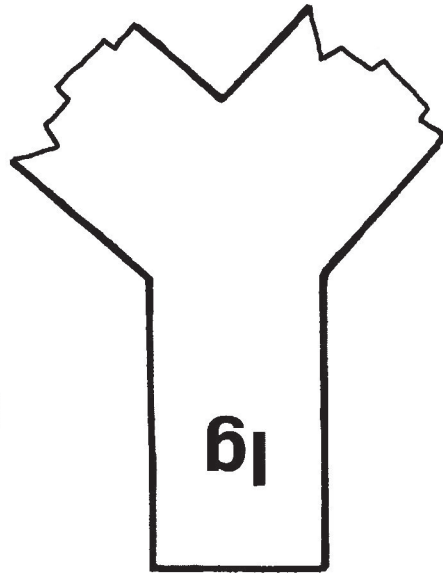
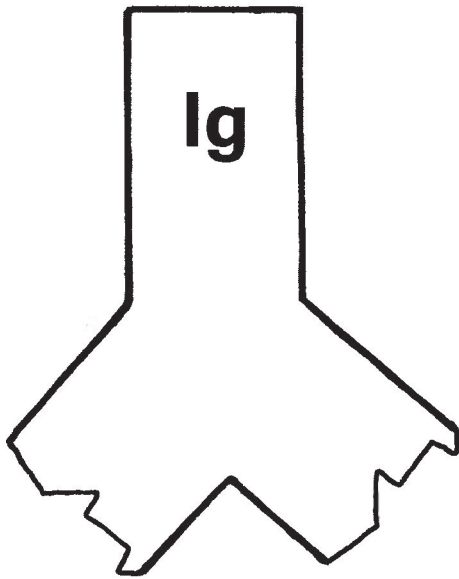
Towards the end of the game, if you happen to spin an antigen letter more than twice, and you happen to have both Ig's for that antigen already in possession of a player/team, just spin again.

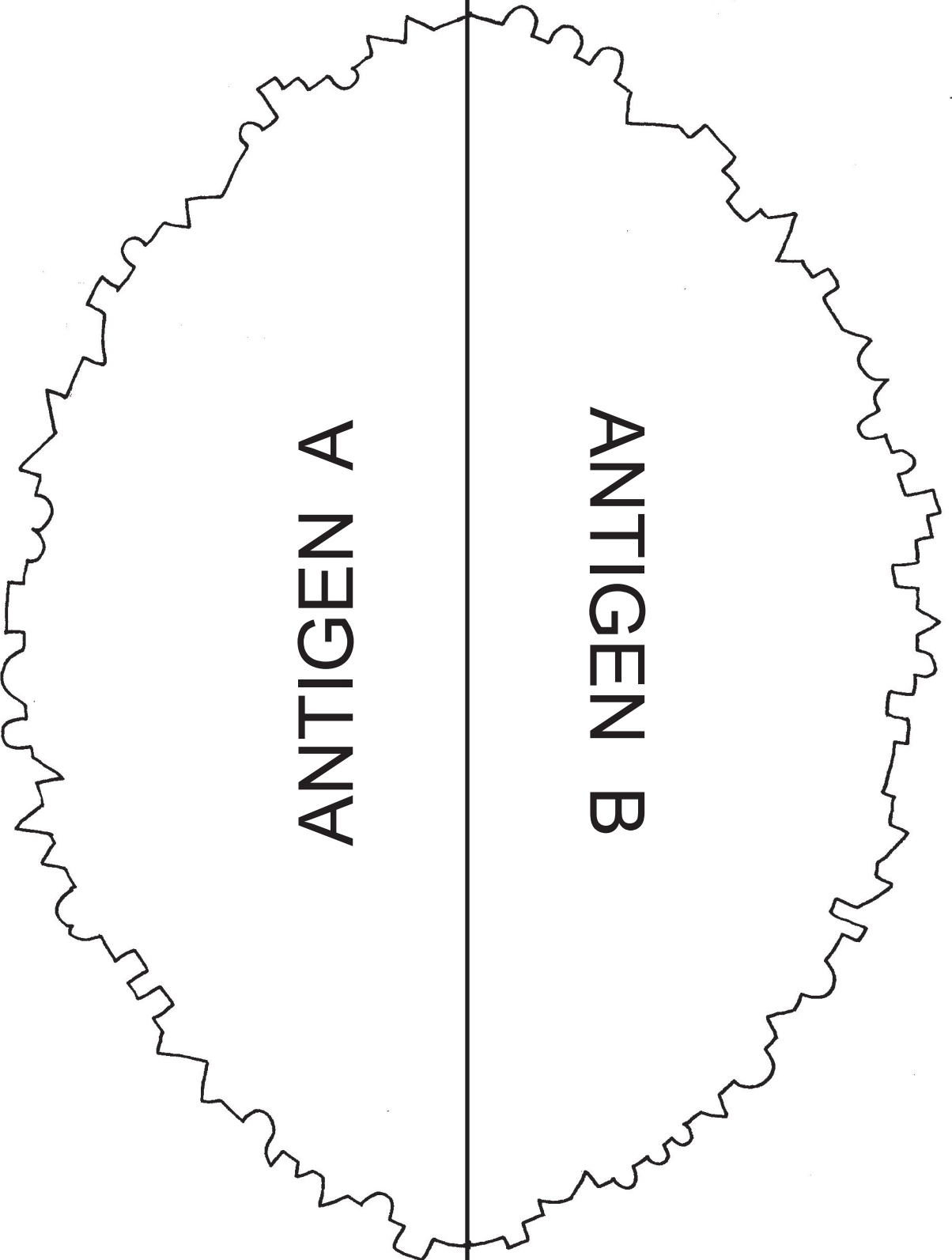
How to win:

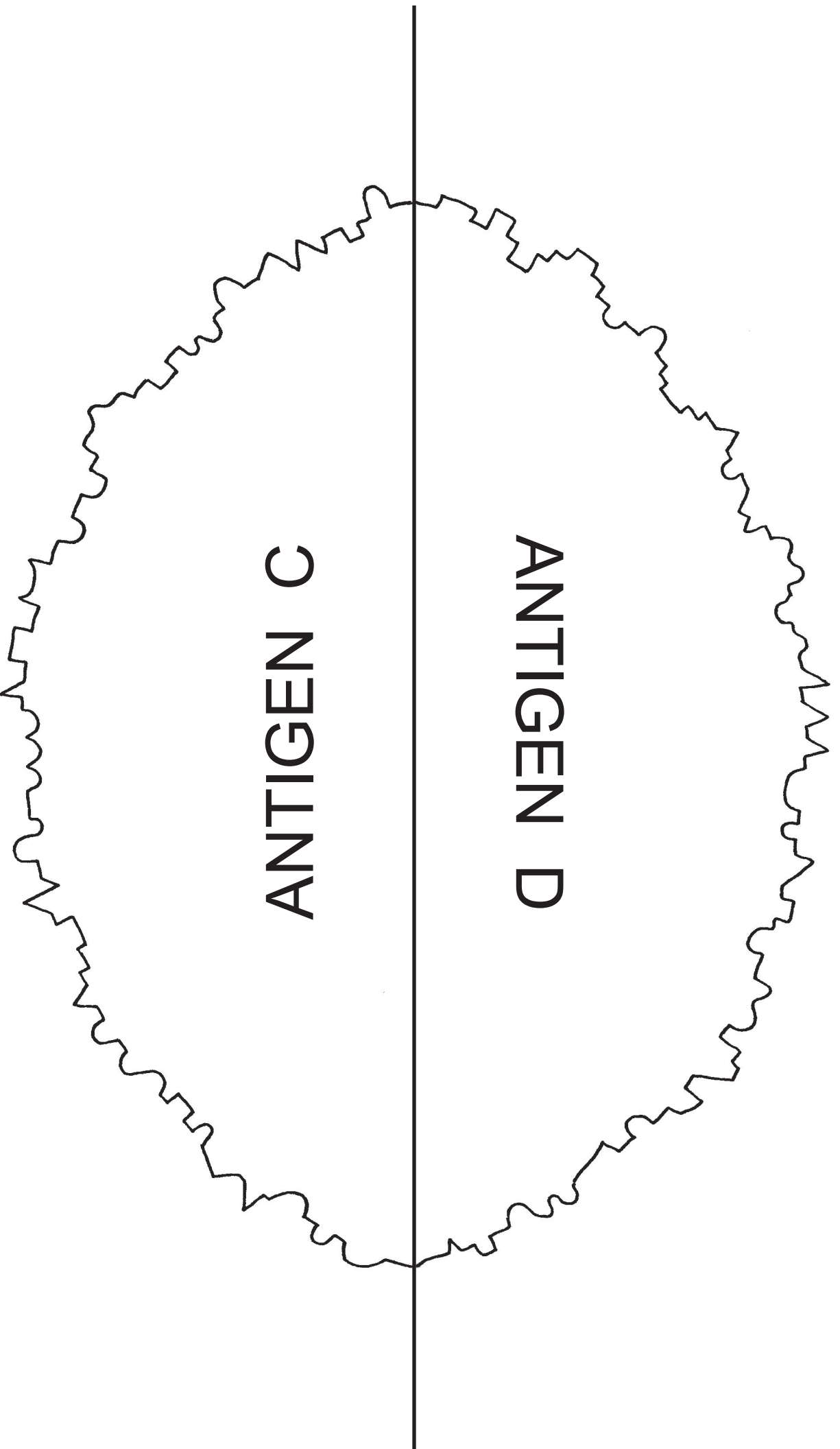
To win the game, a player/team must get 5 antibodies. To add some bonus learning, the players should accumulate their Ig's so that it looks like an IgM antibody. IgMs are the first antibody that a B cell produces. It must interact with a T cell in order to switch to making IgGs. An IgM is made of 5 Ig's arranged in a pentagon shape, as shown.

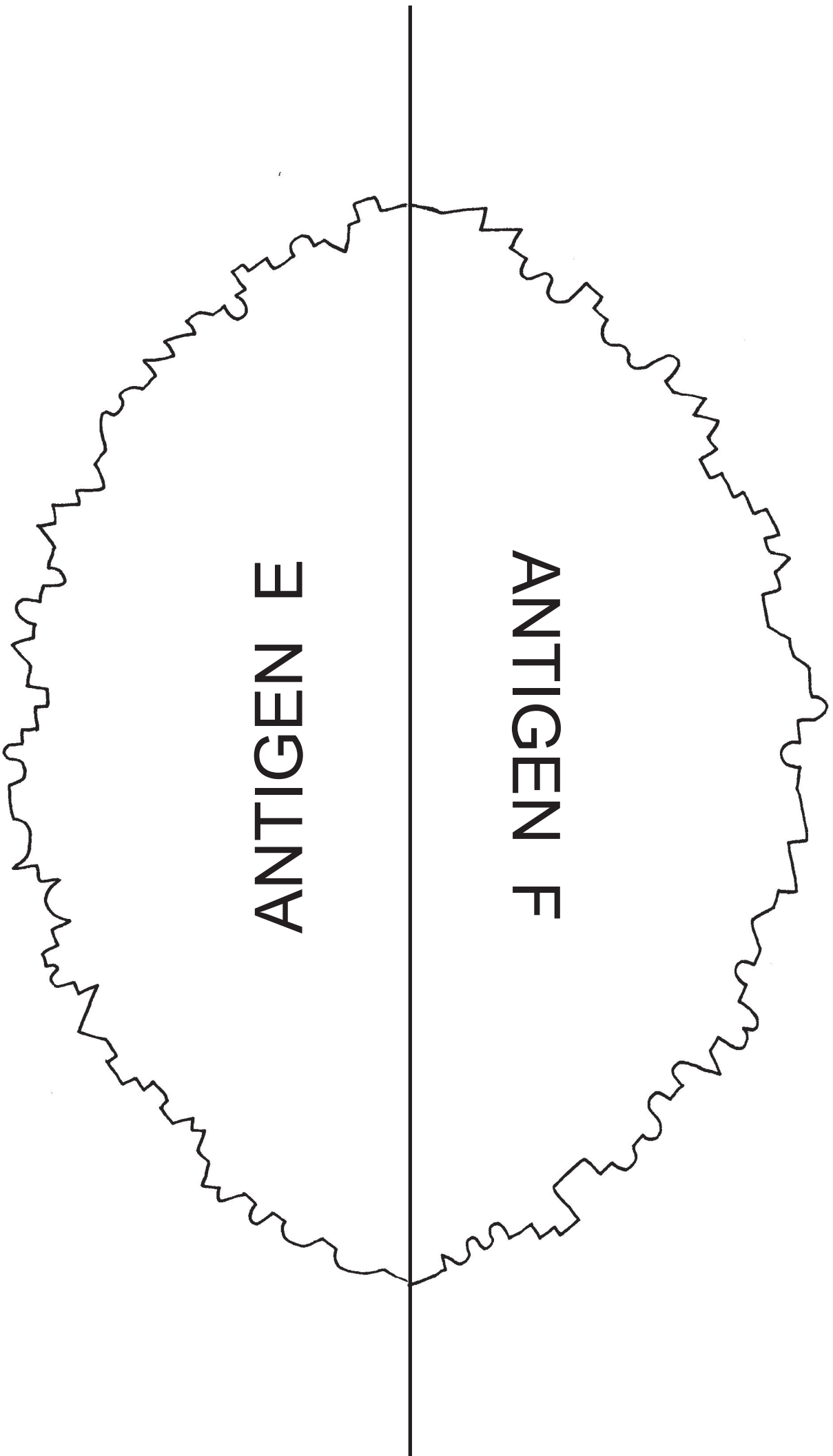


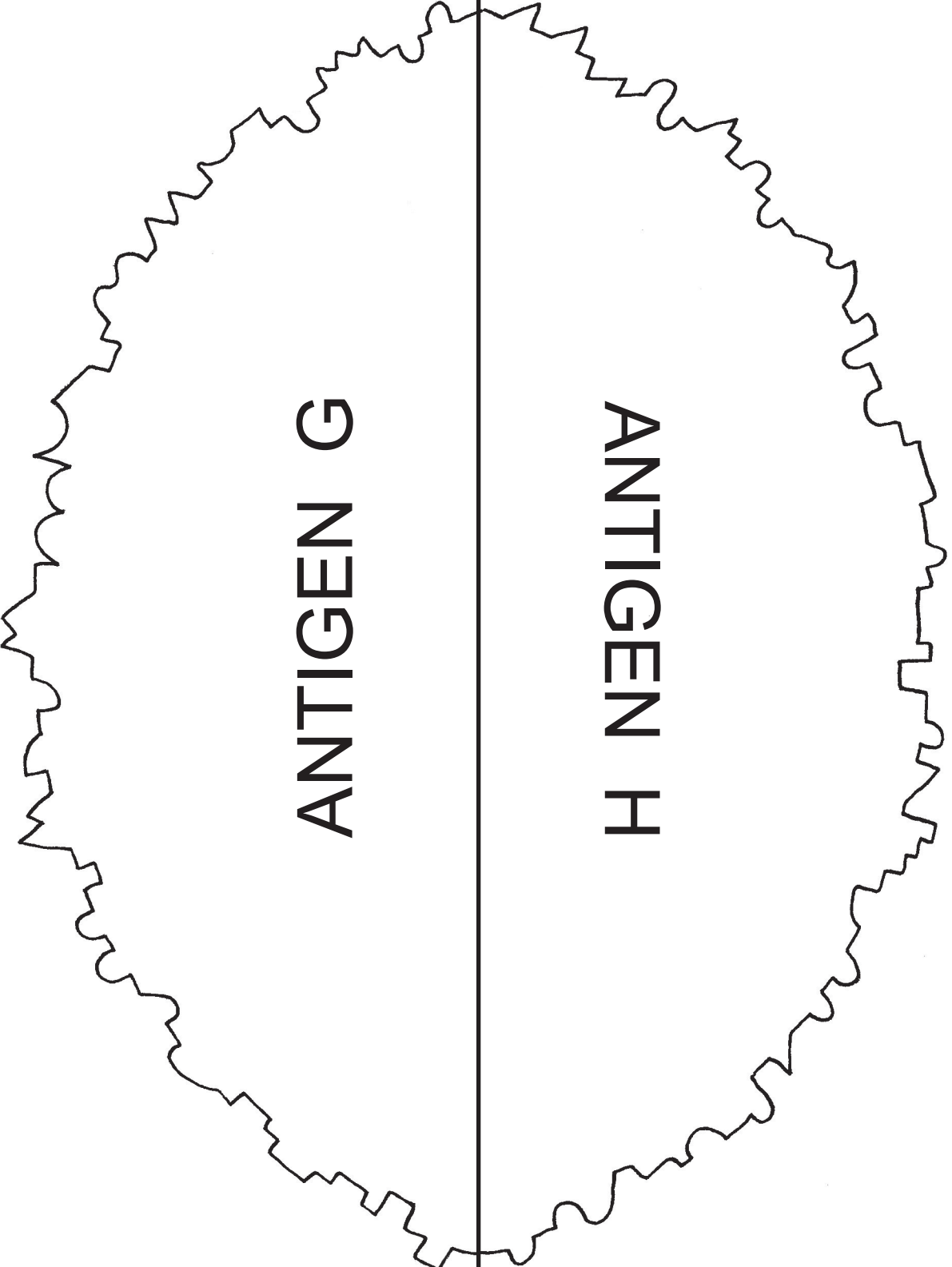






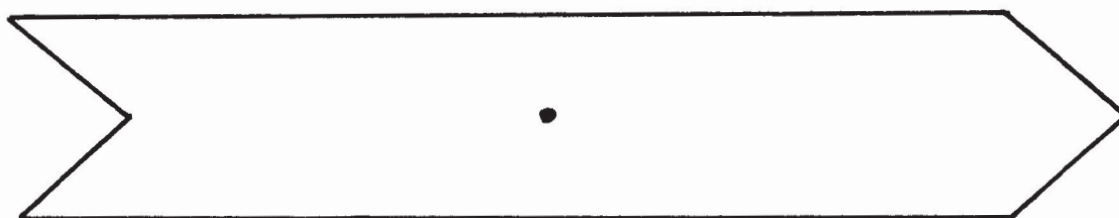
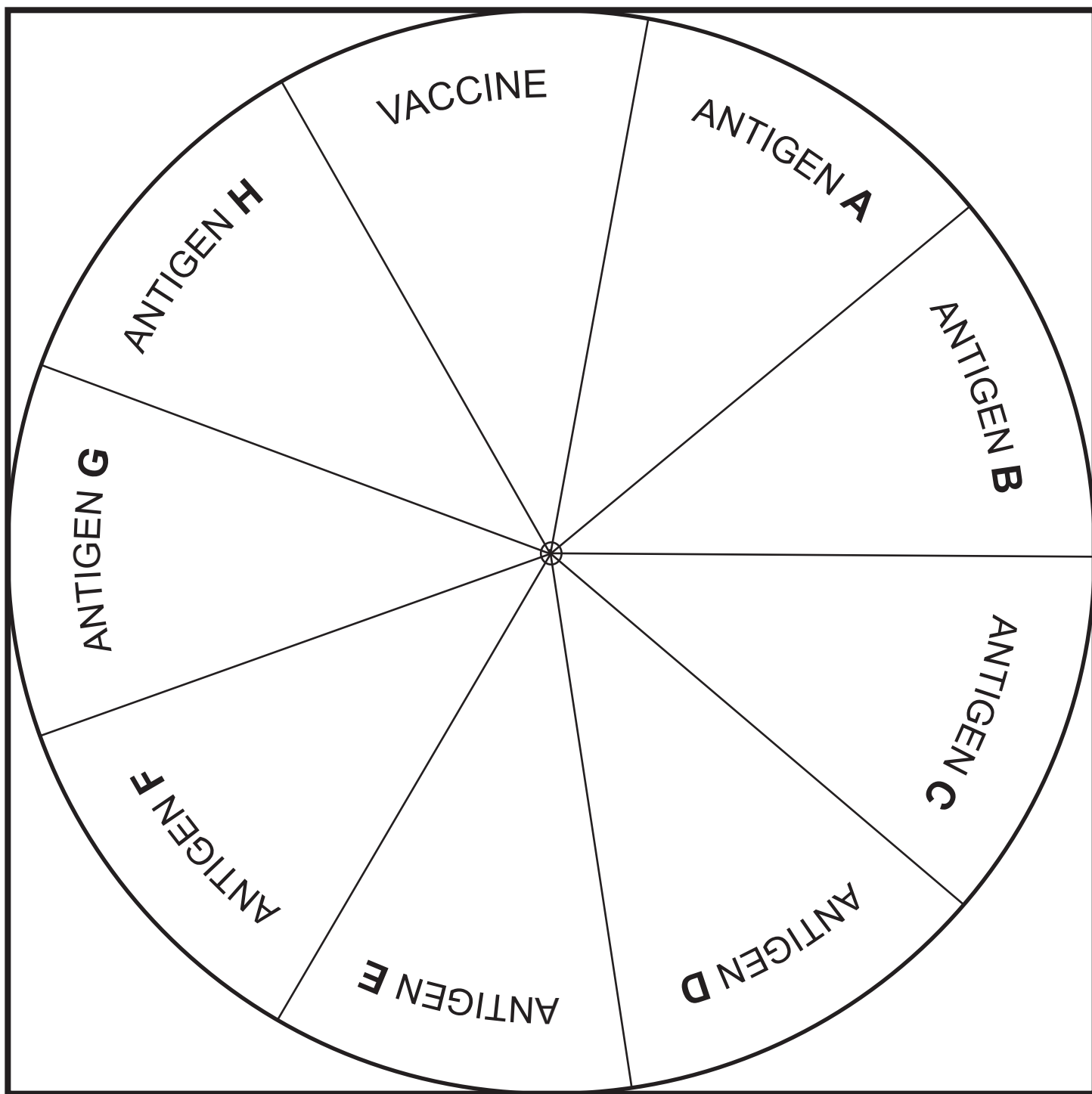






ANTIGEN G

ANTIGEN H



Copy onto heavy card stock

VACCINE

VACCINE

VACCINE

VACCINE

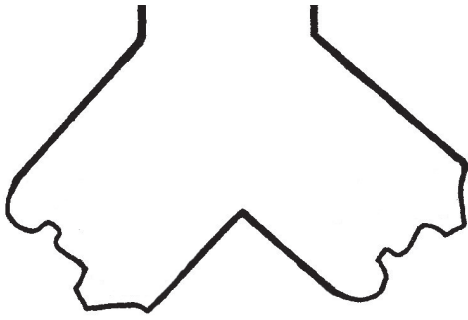
VACCINE

VACCINE

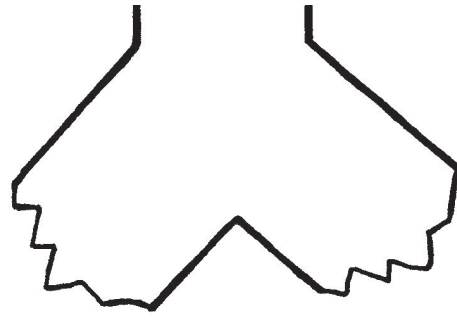
VACCINE

VACCINE

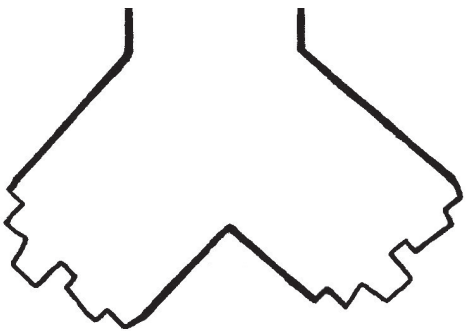
ANTIGEN H



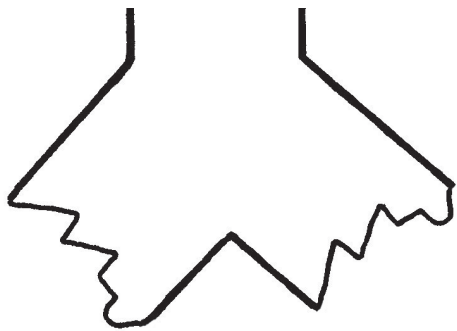
ANTIGEN E



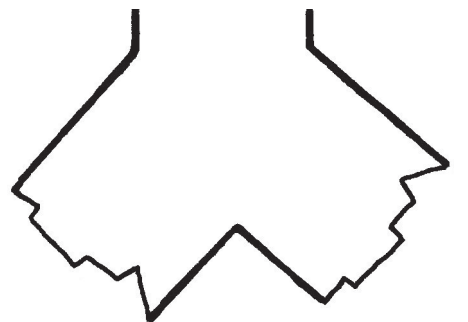
ANTIGEN G



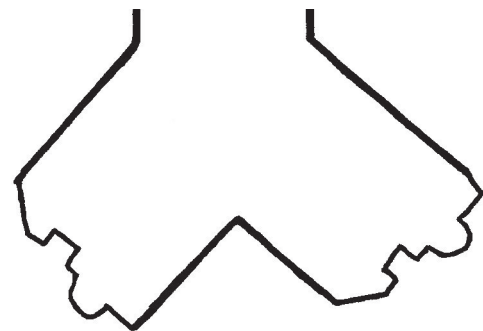
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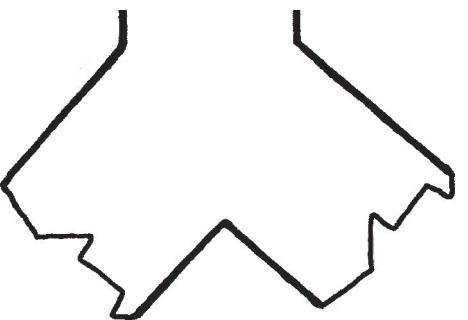
ANTIGEN B



ANTIGEN D



ANTIGEN A



ANTIGEN C

