In a 4-H poultry judging contest, there are three categories involving the grading of table eggs (i.e., eggs for consumption rather than for incubation). These are external, candling, and broken out.

**EXTERIOR EGG QUALITY**

In a 4-H poultry judging contests, eggs are laid horizontally on an egg flat (see Figure 1) and participants grade the exterior quality of the eggs based on the visible portion of each egg. The egg flats can not be handled. Participants are also not allowed to touch the eggs in any way. This includes no blowing on the

![Figure 1. Exterior egg quality class at the Kentucky state poultry judging contest](image)

<table>
<thead>
<tr>
<th>FACTOR</th>
<th>GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>AA or A</strong></td>
</tr>
<tr>
<td>Stain</td>
<td>Clean, but - May show small specks, stains or cage marks that do not detract from general clean appearance of the egg - May show traces of processing oil</td>
</tr>
<tr>
<td>Adhering dirt or foreign material</td>
<td>None</td>
</tr>
<tr>
<td>Egg shape</td>
<td>Approximately the usual egg shape</td>
</tr>
<tr>
<td>Shell texture</td>
<td>May have rough areas and small calcium deposits that do not materially affect shape or strength</td>
</tr>
<tr>
<td>Ridges</td>
<td>Slight ridges that do not materially affect shape or strength</td>
</tr>
<tr>
<td>Shell thickness</td>
<td>Free of thin spots</td>
</tr>
<tr>
<td>Body checks</td>
<td>Absence of body checks</td>
</tr>
</tbody>
</table>
eggs and keeping hair, pencils and eye glasses away from the eggs when they are being examined. Touching an egg may result in disqualification.

The eggs are evaluated using the criteria given in Table 1. Grades AA and A have identical exterior quality standards. Participants should not be too hard in assigning a grade to eggs that have minor defects.

**Cleanliness**

Grade A eggs must be clean. They may show traces of processing oil which is sometimes used to preserve freshness.

**Stains**

Eggs with stains can be Grade B or Dirty/Reject depending on the intensity of the stain, the type of stain, as well as the amount of shell covered by the stain.

- **Stain intensity** can be classified as slight, moderate, or prominent. A slight stain is easily visible from one foot away but difficult to see from about three feet. A moderate stain is easily visible from three feet but difficult to see from about six feet. A prominent stain is easily visible from six feet or more.

- There are two **stain types**, localized and scattered. A localized stain (see Figure 2) is a single stain where all the stained areas are connected. A scattered stain is two or more stained areas on the same egg (see Figure 3).

- The **size** of the stained portions must be mentally added together and the total area of shell compared with the amount of stain allowed for a Grade B egg (see Figure 4). A Grade B egg can have a moderate localized stain covering less than 1/32nd of the shell (Figure 2). For scattered stains the limitation is 1/16th of the shell (Figure 3). If the stains are larger than those listed above, it is a Dirty/Reject egg.

**Adhering material**

Eggs with adhering or foreign material larger than a speck (about 1.0 mm) are considered Dirty/Reject eggs. Small specks of dust or lint that may have settled out of the air should not be considered. The adhering material can be
anything including manure a piece of shell, yolk or albumen (see Figure 5). It also includes a feather. Even though these things can be washed off, the eggs are categorized as Dirty until they are actually cleaned and the adhering material removed. During the Poultry Judging event, if you see a feather on an egg do not blow on it or attempt to remove it in any way.

**Shape**

A Grade A egg should have a ‘typical’ egg shape. There is a considerable range of egg shapes that could be considered ‘typical’ which would all be Grade A’s. Eggs that are too round or too long to fit in the egg carton are Grade B eggs, downgraded because of their shape (see Figure 6). Grade B eggs downgraded for shape will also include those eggs that are clearly misshapen or that have definite flat areas. Any eggs that come in a strange shape are also Grade B (see Figure 6).

**Shell texture**

Eggs with faulty shell texture are much weaker and may be broken on the trip from farm to the consumer’s table. It is primarily for this reason that these eggs are downgraded and do not normally appear in grocery stores.

Shells with large *calcium deposits* (greater than \( \frac{1}{8} \) inch in diameter) are Grade B (see Figure 7). Grade A eggs are allowed smaller calcium deposits (see Figure 8). A good rule of thumb is that if you were to pull your fingernail across a calcium deposit, and there would be a good size hole if it came off, it would be classi-
fied as Grade B. You need to use your imagination for this, however, since touching of the eggs is not permitted.

There is no standard for the number of calcium deposits. Therefore, eggs with small calcium deposits over the entire shell may be classified as Grade A if otherwise qualified (see Figure 8).

Ridges can also result in weakened shells. Many eggs have small ridges and most of these should be classified as Grade A. Those eggs with large ridges, however, are Grade B (see Figure 9). A related condition is shell roughness, without distinct ridges (see Figure 10). It is common, however, to see both conditions on the same egg (see Figure 11).

Body checks

Body checks are another type of faulty shell that result in downgrading of eggs. Body checks are eggs which are cracked when the shell is being formed in the hen's body and then partially calcified over, repairing the damage, before being laid.

Frequently an egg with a body check looks cracked, but it is actually still intact (see Figure 12). The shell does remain weak, however, so commercially these eggs are removed and not sold as table eggs. With some body check eggs the cracks are not as visible, but they can be identified by the bulge in the shell shape (see Figure 13).

Shell thickness

A shell should be thick enough to for the egg withstand a reasonable amount of handling without breaking. Grade A eggs must have thick shells with no thin spots. Thin shells or thin spots would result in an egg being downgraded to a B. The egg in Figure 14 has a relatively large weak area. Eggs can also have small, weak shells in one area of an egg, such as the egg in Figure 15 which has a weak area (or 'window') in the large end of the shell. Both eggs would be Grade B.
An example of the score card for an exterior egg class is shown in Figure 16. The card has been filled out to demonstrate how a card should be filled out. It is important to note that the X’s fall within the boundaries of the box and do not spill into neighboring boxes.

In a 4-H poultry judging event there are several participants grading a set of eggs at the same time. It may not be possible to start at egg number 1 and work your way to egg number 20. When marking your card make sure that you are marking the grade for the correct egg. Any egg for which no grade is indicated will be scored as zero. If two grades are marked for an egg, the lower score will be taken.

**INTERIOR EGG QUALITY**

In a 4-H poultry judging event participants are required to evaluate the contents of an egg and grade them AA, A, B or Reject (also called Inedible). Some eggs are evaluation with an intact egg, as would be done in a commercial operation. This involves candling the egg. In the contest an additional set of eggs are broken out on to plates to evaluate an egg from the consumers perspective. To understand the...
criteria used in these evaluations it is important to have knowledge of the parts of an egg (see Figure 17).

The egg contents are surrounded by two membranes—an inner and outer shell membrane—and, of course, the shell. When an egg is first laid these two membranes are closely attached on the inner lining of the shell. The temperature of the contents of a freshly laid egg is slightly lower than that of the body temperature of the hen (105-107°F) but quickly cools to room temperature. As the egg contents cool they contract, separating the inner and outer shell membranes slightly, typically at the large end of the egg. This is referred to as the air cell. As an egg ages it loses moisture and the contents contract even more, enlarging the air cell. Air cell size, therefore, is a good indication of egg quality and can be evaluated without breaking the egg open.
As an egg ages the thick albumen breaks down reducing its height and volume. The amount of thin albumen is increased.

**CANDLING**

Candling is done in a dark room with the candler light turned on. To candle an egg, hold it up to the candler with the large end against the light (see Figure 19). It is best to hold the egg between your thumb and first two fingers. If you feel you may drop the egg, place your other hand underneath to catch any eggs that may drop. With the egg at an slight angle, turn your wrist first one direct and then the other. This will cause the inside content of the egg to whirl. Repeat the procedure with the small end of the egg against the light. This procedure will allow you to determine if a meat or blood spot is present. If so, this will immediately make the egg a ‘Reject’ egg and no other evaluation is needed.

Blood or meat spots can be in the albumen or on the yolk. Spots on the yolk typically appear as a bright red area. Figure 20 is an example of a blood spot that is loose in the albumen of the egg. When the egg is twirled during candling the spot will float around. Some spots may be in the small end of the egg and difficult to see if you don’t candle from that end, so to look for blood and meat spots it is important to candle the egg from the large and small end.

If no blood or meat spots are detected return the large end of the egg to the light and observe the size of the air cell). The size of the air cell determines the grade as either AA, A, or B according to USDA standards (see Figure 21). Eggs with air cells less than $\frac{1}{8}$ inch deep are Grade AA. Eggs with an air cell greater than $\frac{1}{8}$ inch deep but less than $\frac{3}{16}$ inch is a Grade A. Anything greater than $\frac{3}{16}$ inch is a Grade B. There is a third air cell depth indicator on the card, for an air cell depth of $\frac{3}{8}$ inch. This is no longer used. In the past there was a fourth possible grade for eggs, Grade C. This grade on longer exists but the card has not been changed.

Examples of candled eggs are shown in Figure 22. As a rule of thumb, those eggs with an air cell smaller than the size of a dime are Grade AA and those larger than a dime but smaller than a nickel are Grade A. Anything larger than a nickel is a Grade B.

An example of a properly filled out score card for grading candled eggs is shown in Figure 23. As with the card for exterior egg quality grading, it is important to make sure that the
X’s fall within the boundaries of the box and do not spill into neighboring boxes. In a 4-H poultry judging event it is common to have your own (or part) of a set of eggs to grade. The number of the egg will be written on it. While it is possible to grade the eggs in order, it is also possible for the eggs to get out of order. When marking your card make sure that you are marking the grade for the correct egg. Again, any egg that does not have a grade marked will be scored as zero. If an egg has two grades marked, the lower score will be used.

**BROKEN OUTS**

In a 4-H poultry judging event, participants are required to grade a group of eggs broken out on to plates. Again, the grades are AA, A, B or Reject/Inedible.

Reject/Inedible eggs are those that contain blood or meat spots greater than $\frac{1}{8}$ inch (see Figure 24). Eggs with blood or meat spots less than $\frac{1}{8}$ inch are classified as Grade B.

In Figure 25 the egg in photo A has the blood spot on the yolk of the egg while in photo B the blood is dispersed throughout the albumen. When candling the egg in photo B the contents of the egg would have appeared red—a clear indication of blood in the egg.

The criteria used to grade broken-out eggs is the height of the thick albumen relative to the egg’s size.

Broken out grade determination is based on USDA’s standards (see Figures 25-27). It is important to assign the grade based on a comparison with USDA standards and not compare the
different eggs. The diameter of the thick albumen, as seen from the top view, may give an indication of a grade, but it is the height of the thick albumen, as seen by the side view, that is the most important factor in assigning a grade. Some examples are shown in Figure 28.

The score card for grading broken out eggs is similar to the one for candling. The eggs will be broken out on a plate. As with the exterior egg quality class, there are typically several participants grading the eggs at one time so that it may not be possible to start on egg one and work your way through to the end of the class. When marking your card make sure that you are marking the grade for the correct egg.
Figure 25. USDA standards for Grade AA eggs.
Figure 26. USDA standards for Grade A eggs.
Figure 27. USDA standards for Grade B eggs.
Grade AA in Figure 28: Note that the albumen (also known as egg white) is thick and firm. The area covered by the albumen is small. There is a large proportion of thick white relative to thin white.

Grade A egg in Figure 27: Note that the albumen is still reasonably firm but not as high as in the Grade AA egg. The area covered by the albumen is still reasonably small, but definitely different than for the Grade AA egg.

Grade B egg in Figure 27: Note that the egg whites are thinner than the other two eggs. The albumen spreads out much more and there is much more thin albumen relative to the amount of thick albumen.