



4AJ-05PO

Kentucky 4-H Poultry: Grading Eggs

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

Exterior Egg Quality

In the contest, eggs are laid horizontally on an egg flat (see Figure 1), and participants grade the exterior quality of the eggs based on the top half of each egg. The egg flats cannot be handled. Participants also are not allowed to touch the eggs. Blowing on the eggs is not allowed, and participants must keep hair, pencils, and eyeglasses 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.

Figure 1. Exterior egg-quality class at the Kentucky state poultry judging contest.



Table 1. Summary of USDA Standards for the Exterior Quality of Table Eggs.

FACTOR	GRADE		
	AA or A	B	Dirty/Reject
Stain	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	Slight or moderate localized stains less than 1/32 nd of shell OR Slight or moderate scattered stains less than 1/16 th of shell	Prominent stains OR Slight or moderate stains covering more than 1/32 nd if localized and 1/16 th of the shell if scattered
Adhering dirt or foreign material	None	None	Adhering dirt or foreign material (1.0 mm in area or greater)
Egg shape	Approximately the usual egg shape	Unusually or decidedly misshapen	
Shell texture	May have rough areas and small calcium deposits that do not materially affect shape or strength	Extremely rough areas that may be faulty in soundness or strength. May have large calcium deposits.	
Ridges	Slight ridges that do not materially affect shape or strength	May have pronounced ridges	
Shell thickness	Free of thin spots	May have pronounced thin spots	
Body checks	Absence of body checks	May show pronounced body checks	

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.
- The two **stain types** are 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 separate stained areas on the same egg (see Figure 3).
- The **size** of the stained portions must mentally be added together, and the total area of shell must be 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 a thirty-second of the shell (Figure 2). For scattered stains, the limitation is one-sixteenth of the shell (Figure 3). If the stains on an egg are larger than those listed above, it is a Dirty/Reject egg.

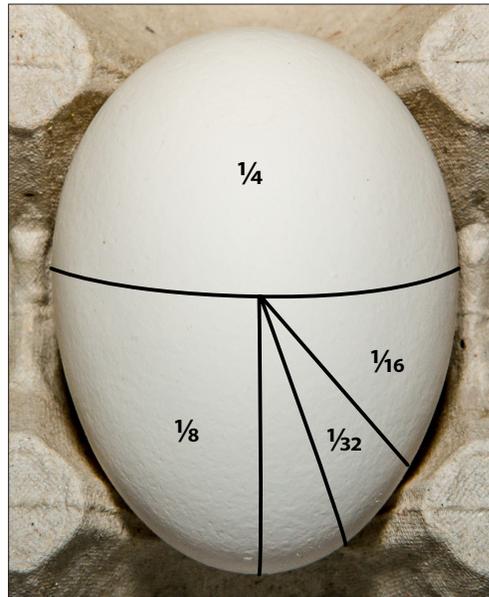
Figure 2. Examples of eggs with moderate localized stains.



Figure 3. Example of egg with moderate scattered stains.



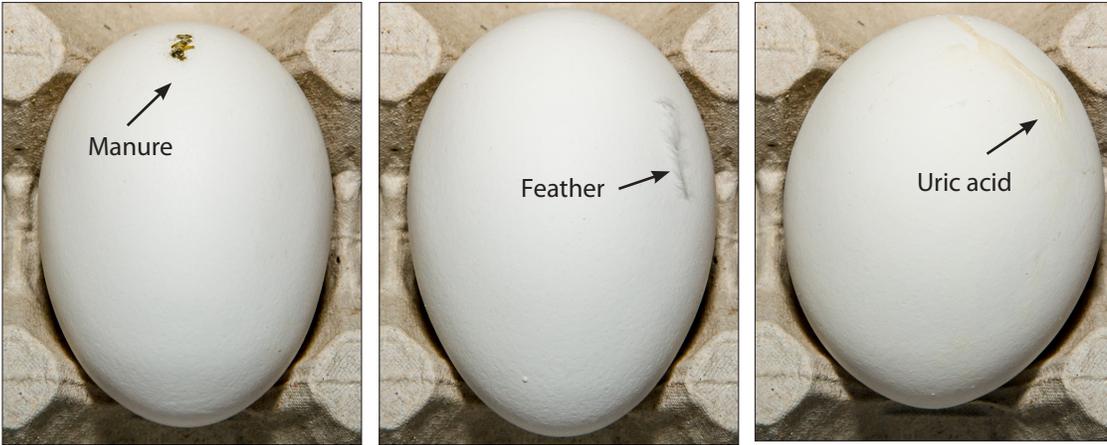
Figure 4. An egg marked to show fractions of its shell surface.



Adhering material

Eggs with adhering or foreign material larger than a speck (about 1 millimeter) are considered Dirty/Reject eggs. Small specks of dust or lint that might 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. If you see a feather on an egg during the poultry judging event, do not blow on it or attempt to remove it.

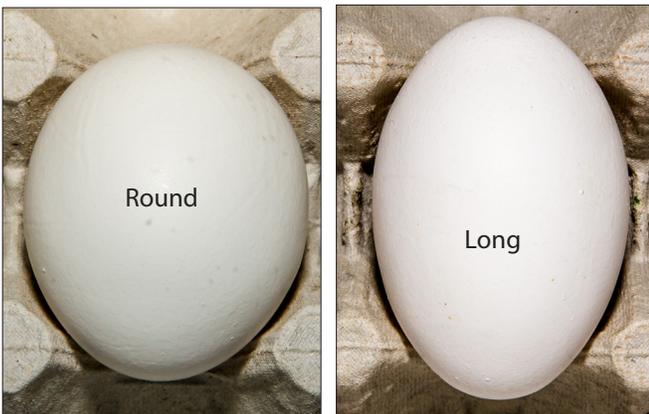
Figure 5. Examples of different 'dirty' eggs with adhering material.



Shape

A Grade A egg should have a typical egg shape. A considerable range of egg shapes 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 also will include those eggs that clearly are misshapen or have definite flat areas. Any eggs that come in a strange shape also are Grade B (see Figure 6).

Figure 6. Grade B eggs downgraded because of shape.



Shell Texture

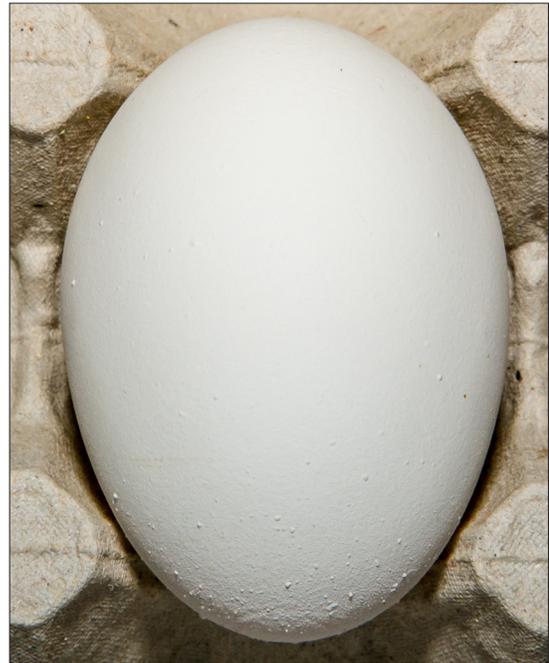
Eggs with faulty shell texture are weaker and may be broken on the trip from the farm to the consumer's table. It is primarily for this reason that these eggs are downgraded and do not normally appear in grocery stores.

Shells with large **calcium deposits** (greater than one-eighth of an 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

Figure 7. Examples of Grade B eggs with calcium deposits.



Figure 8. Examples of Grade A eggs with small calcium deposits.



if you were to pull your fingernail across a calcium deposit and a good-size hole of it came off, it would be classified as Grade B. You need to use your imagination for this, however, since touching 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 also can result in weakened shells. Many eggs have small ridges, and most of these should be classified as Grade A. 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

A body check is another type of faulty shell that results in the downgrading of eggs. Body checks form in a hen's body. The egg is cracked as it is being formed and then partially calcified over before it is laid.

Frequently an egg with a body check looks cracked, but it is 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-checked 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 for the egg to 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 Grade B. The egg in Figure 14 has a relatively large weak area. Eggs also can have small, weak shells in one area of an egg, such as the egg in Figure 15 that 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 example demonstrates 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, several participants grade a set of eggs at the same time. It might not

Figure 9. Example of a Grade B egg downgraded for ridges.



Figure 10. Example of a Grade B egg downgraded because of its rough shell.



Figure 11. Example of an egg with both distinct ridges as well as a rough shell.



Figure 12. Example of a body-checked egg with appearance of cracks.



Figure 15. Example of a Grade B egg with a small thin spot, or 'window,' in the large end.

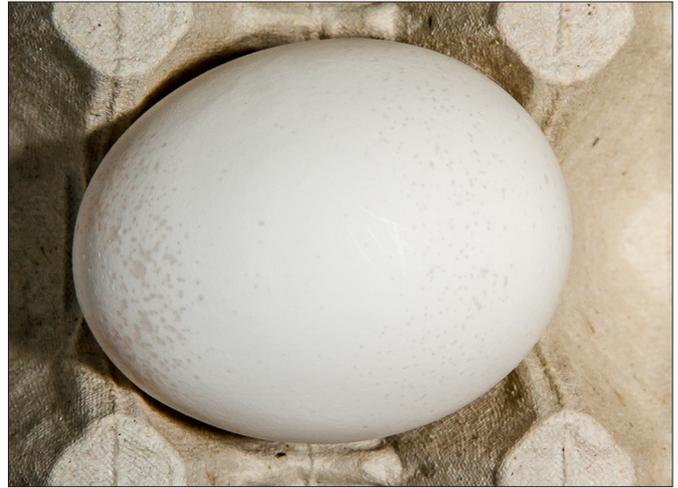


Figure 13. Example of a body-checked egg with a bulge in the shell.

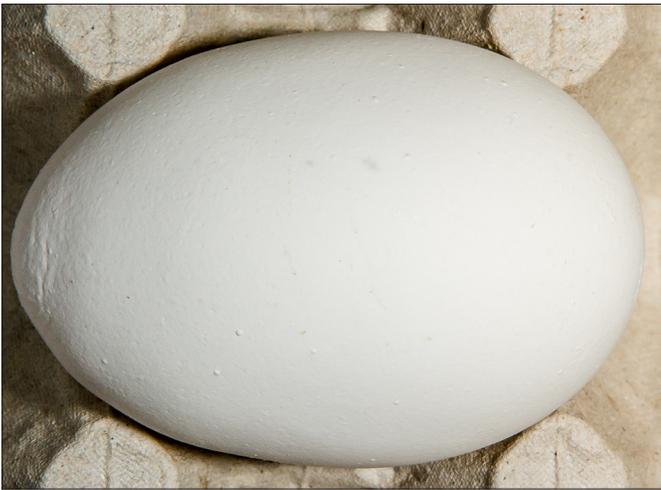


Figure 16. Properly filled-out scoring card for exterior egg-quality grading.

Kentucky 4-H Poultry Judging Event

Contestant Number 12

CLASS F – Exterior Egg Quality

NO.	Quality			Score
	A	B	Reject	
1	X			
2	X			
3			X	
4		X		
5		X		
6		X		
7	X			
8			X	
9		X		
10		X		
11	X			
12	X			
13	X			
14			X	
15		X		
16	X			
17	X			
18	X			
19		X		
20		X		

Total score _____

Name Cherish Joe

County Calloway

Figure 14. Example of a Grade B egg with a large thin spot in the shell.



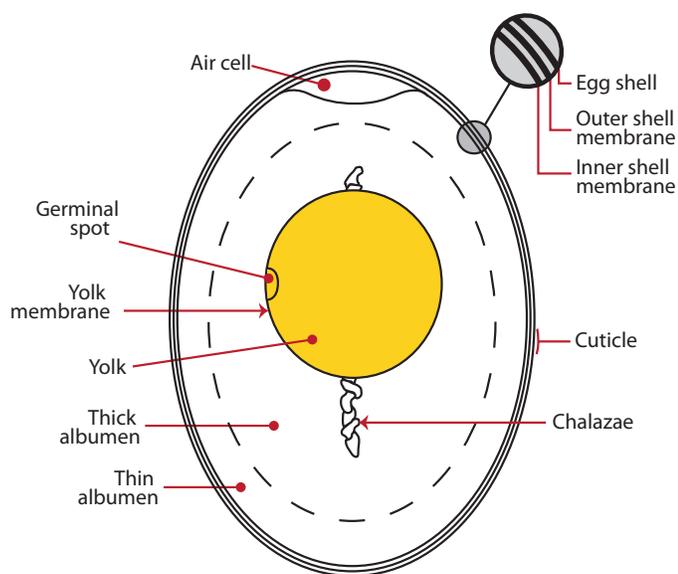
be possible to start at egg number 1 and end at egg number 20. When marking your card, make sure you are marking the grade for the correct egg. Any egg for which no grade is indicated will be scored as zero. If two grades are marked for an egg, the lower score will be taken.

Internal Egg Quality

Participants are required to evaluate the contents of an egg and grade them AA, A, B, or Reject (also called Inedible). Some eggs are evaluated as an intact egg, as would be done in a commercial operation. This process involves candling the egg. An additional set of eggs are broken out onto 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 the shell. When an egg is first laid, these two membranes are attached closely on the inner lining of the shell. The temperature of the contents of a freshly laid egg is slightly lower than 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 interior egg quality and can be evaluated without breaking the egg open.

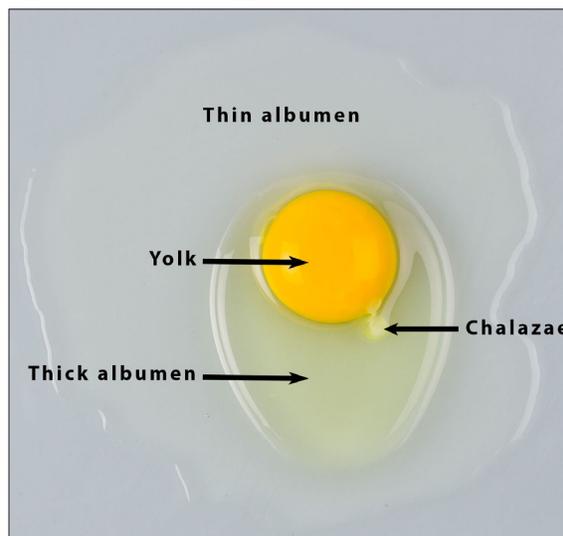
Figure 17. The parts of an avian egg.



When an egg is broken open, it is possible to see the parts making up the egg's contents (see Figure 18). The yolk is in the center of the egg and is held in position by the chalazae, located on the two poles of the yolk (difficult to see in the photo). The yolk is surrounded by a layer of thick albumen and finally by the thin albumen. The blastodisc, which contains the genetic material of the female chicken, is located on the surface of the yolk.

As an egg ages, the thick albumen breaks down, reducing its height and volume. The amount of thin albumen is increased.

Figure 18. Parts of an egg without its shell.



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 think you might drop the egg, place your other hand underneath to catch it. With the egg at a slight angle, turn your wrist first one direction 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

Figure 19. Using a candler to determine internal egg quality.



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. To look for blood and meat spots, it is important to candle the egg from the large and small ends. Meat spots are usually in the albumen and have a halo (clear spot) around them.

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 smaller than one-eighth of an inch deep are Grade AA. Eggs with air cells greater than one-eighth of an inch deep but smaller than three-sixteenth of an inch are Grade A. Anything greater than three-sixteenths of an inch is Grade B.

The grading card in Figure 21 is a training tool only and cannot be used in a poultry judging contest.

Figure 20. Example of an egg with a blood spot loose in the albumen

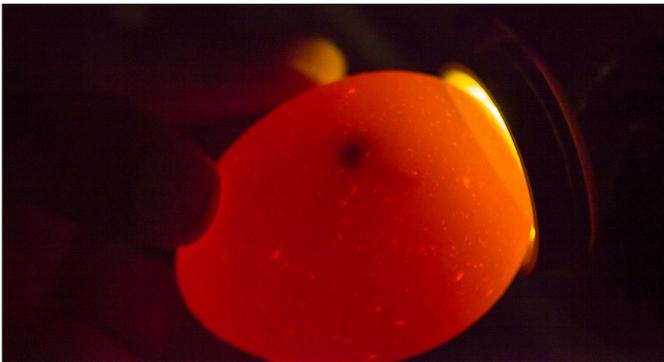
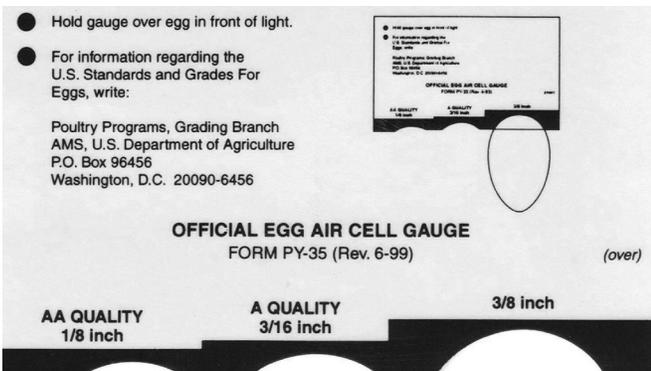


Figure 21. Official egg air-cell gauge used to determine the grade of an egg based on quality of interior contents.



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 nickel are Grade AA and those larger than a nickel but smaller than a quarter are Grade A. Anything quarter size or larger is Grade B.

Figure 22. Examples of different air-cell sizes as seen when candling eggs.



Grade AA



Grade A



Grade B

An example of a properly filled-out score card for grading the interior quality of eggs by candling is shown in Figure 23. As with the card for exterior egg-quality grading, it is important to make sure 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 set or partial 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.

Figure 23. Properly filled-out scoring card for interior egg-quality grading.

Kentucky 4-H Poultry Judging Event					
Contestant Number <u>13</u>					
CLASS H – Interior Egg Quality					
NO.	Quality				Score
	AA	A	B	Reject	
1			X		
2				X	
3				X	
4	X				
5	X				
6	X				
7			X		
8			X		
9		X			
10		X			
11		X			
12		X			
13				X	
14				X	
15				X	
16	X				
17	X				
18		X			
19			X		
20		X			

Total score _____

Name Mary Major

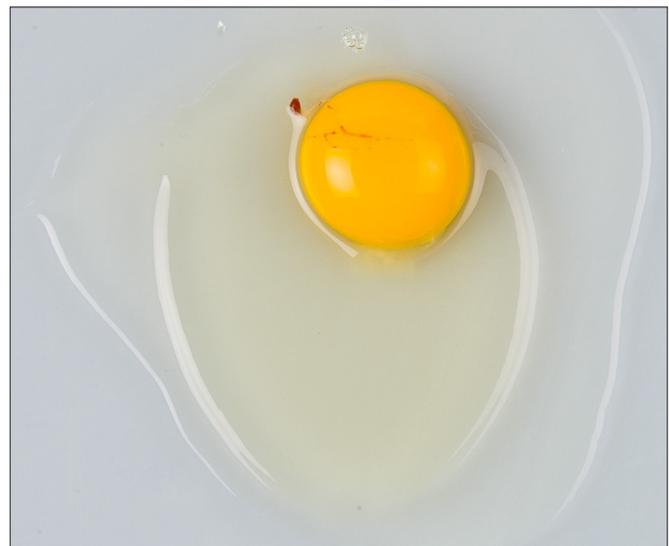
County Lawrence

dispersed throughout the albumen. When candling the egg in Photo B, the contents of the egg would appear red—a clear indication of blood in the egg.

The criterion 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 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 in 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, several participants typically are grading the eggs at one time, so 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 24. Examples of reject/inedible broken-out eggs.



Broken-Out Eggs

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

Reject/Inedible eggs are those that contain blood or meat spots greater than one-eighth of an inch (see Figure 24). Eggs with blood or meat spots less than one-eighth of an inch are classified as Grade B.

In Figure 24, the egg in the Photo A has the blood spot on the yolk of the egg, while in Photo B the blood is

Figure 25. USDA standards for Grade AA eggs.

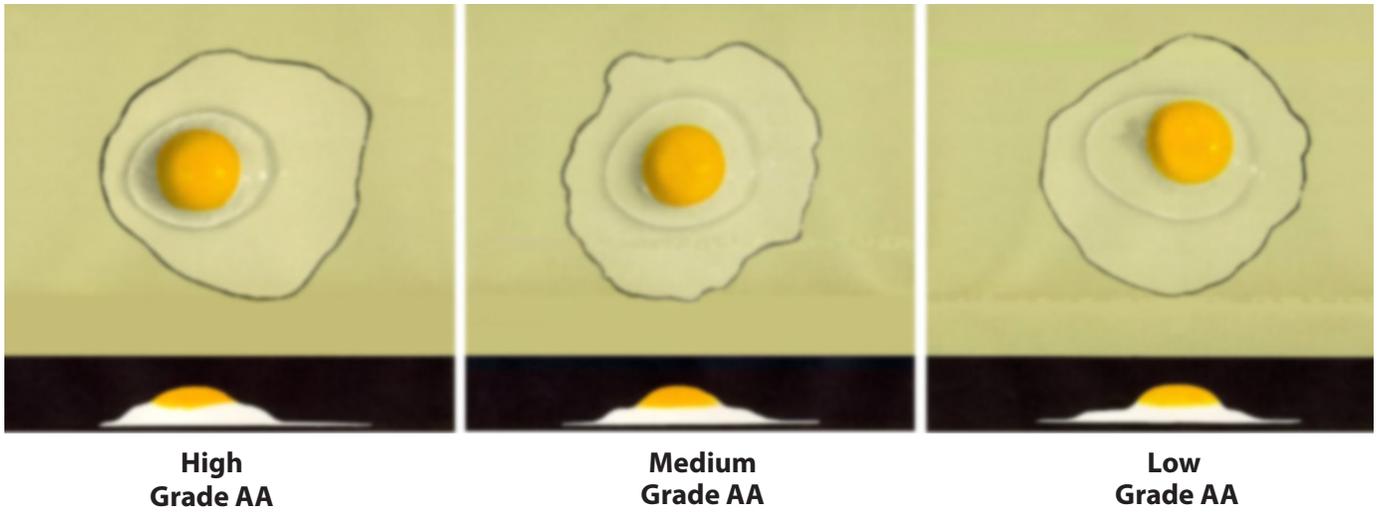


Figure 26. USDA standards for Grade A eggs.

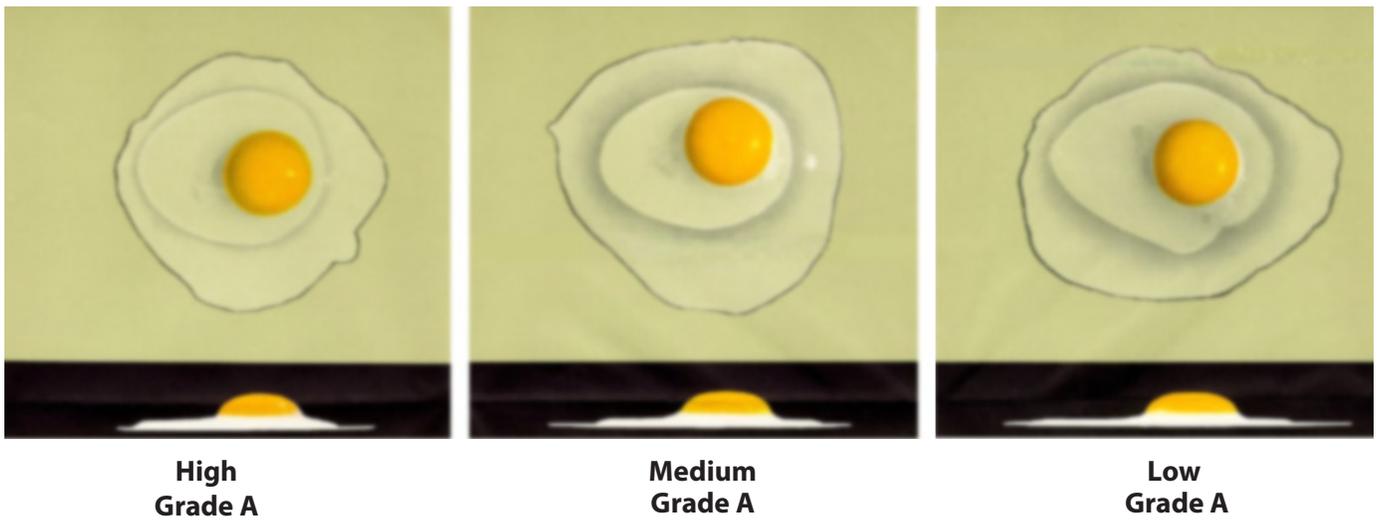


Figure 27. USDA standards for Grade B eggs.

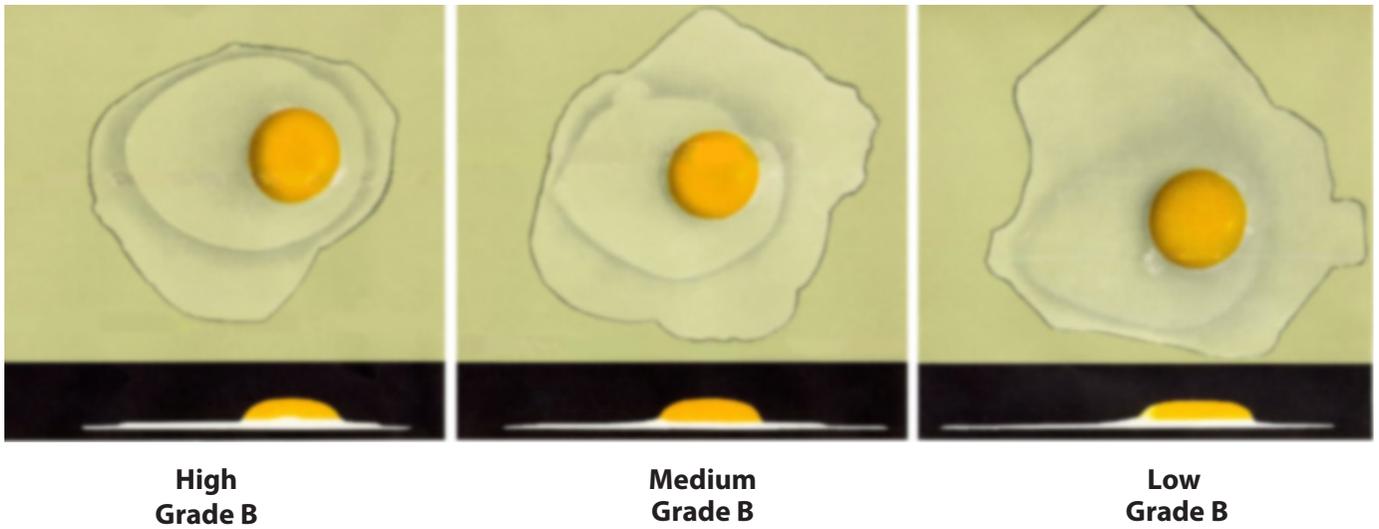
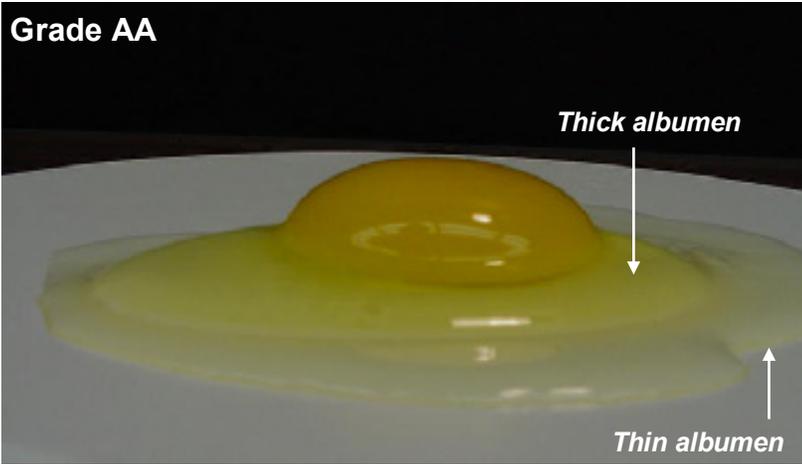
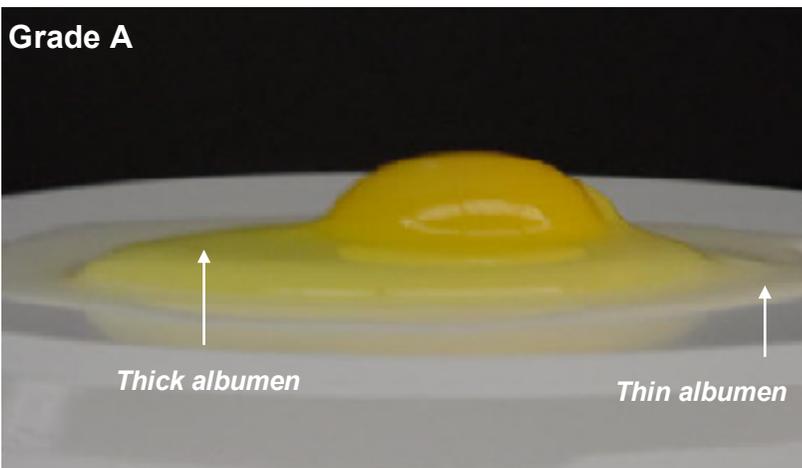


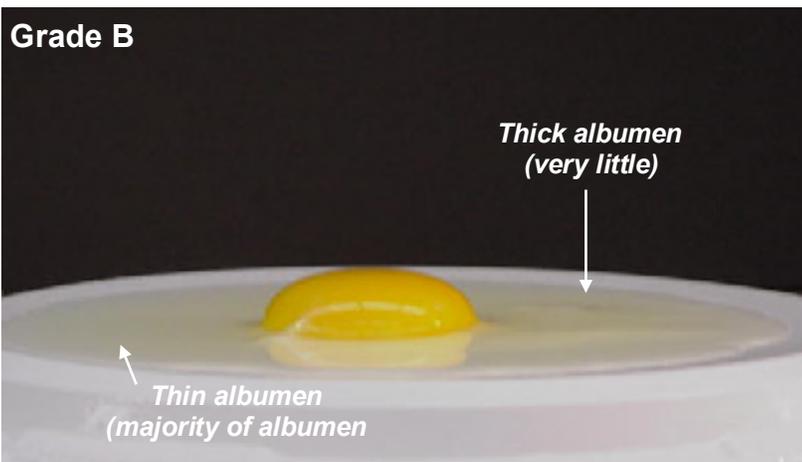
Figure 28. Examples of different grades of broken-out eggs.



Grade AA: Note that the albumen is thick and firm. The area covered by the albumen is small. A large portion of thick white is visible relative to thin white.



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



Grade B: Note that the egg whites are thinner than the other two eggs. The yolk appears flat. The albumen spreads out much more, and more thin albumen is visible relative to the amount of thick albumen.