



Kentucky 4-H Poultry Judging Contest Market Egg Division



Grading Table Eggs

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Chicken egg production is a major agricultural industry in the United States. In a commercial egg production operation, eggs are evaluated for quality before being packed by weight (size). Egg quality is independent of egg weight and eggshell color. All shell colors are graded with the same standards.

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 quality, interior quality by candling, and interior quality of broken out eggs.

Exterior Egg Quality

Commercially, evaluating eggs for exterior quality reduces the number of eggs with defects that reach the consumer. These defects could detract from the eggs' appearance or could reduce the likelihood of the eggs surviving the rigors of handling and shipping in normal market channels. The commercial egg industry wants the eggs that reach the consumer to be clean, unbroken and with practically normal shape and texture.

Shell eggs are evaluated using the criteria given in Table 1 (on the back page). New to the 4-H poultry judging contest in 2021, the grade of "Reject" has been changed to "Dirty" and an additional grade has been added – "Loss." Grades AA and A have identical exterior quality standards. The four possible grades for exterior quality in a 4-H poultry judging contest are now A, B, Dirty, and Loss. New to the contest in 2021, any color of eggshell can be used in the exterior egg quality classes. Shell color does not affect the quality of the egg and is not a factor in the U.S. Standards and Grades.



Figure 1. Layout of the exterior egg grading classes at the Kentucky 4-H Poultry Judging Contest

In 4-H poultry judging contests, participants are not allowed to touch the eggs in the exterior quality classes. This includes no blowing on the eggs and keeping hair, pencils, and eyeglasses away from the eggs when they are being examined. Touching an egg may result in disqualification. Since participants cannot handle the eggs, the eggs are placed sideways on egg flats and participants are to assume the unseen side is free of any stains, adhering material, cracks, or defects (see Figure 1). The egg flats may not be touched or handled in any way.

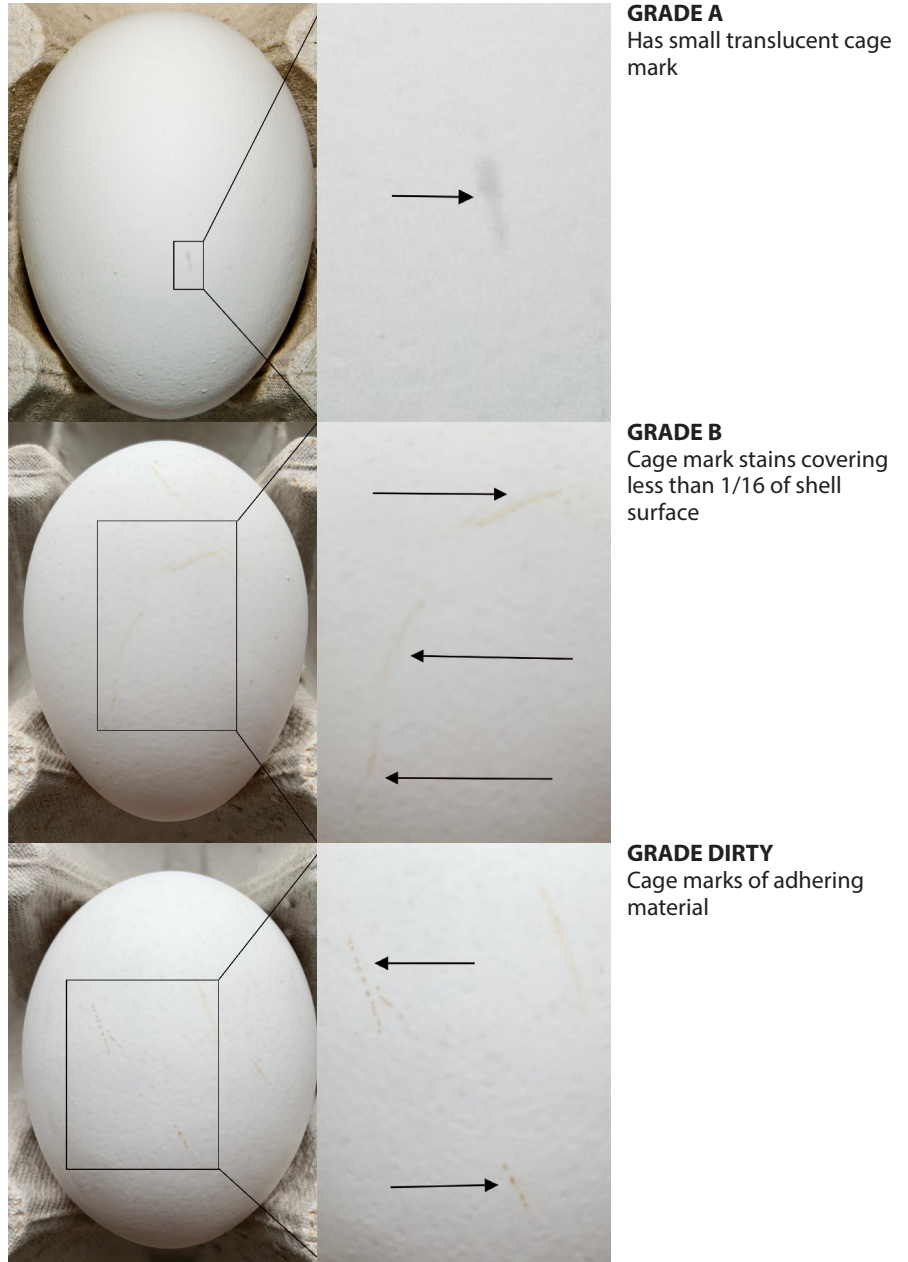
Cleanliness

Grade A eggs must be clean (see Figure 2). Grade A eggs may show small specks, stains, or cage marks that do not detract from the general clean appearance of the egg. Grade A eggs may show traces of processing oil which is sometimes used to preserve freshness. The processing oil may create a shiny or opaque appearance.

“Cage marks” is a term used to refer to marks or translucent lines on the shell when the eggs are collected (see Figure 3). The translucent lines result when the shell fails to dry out quickly after laying. Grade A eggs may show small cage marks that do not detract from the general appearance of the egg. Darker cage marks that do detract from the appearance of the would make the eggs Grade B. Marks or lines are due to rusty or wires in the cage floor or egg roll-out trays. Such eggs cage marks having a 3-dimensional appearance would be considered Dirty eggs.



Figure 2. Grade A eggs that are (left to right) white, brown, and green. They are clean, normal-shaped eggs.



GRADE A
Has small translucent cage mark

GRADE B
Cage mark stains covering less than 1/16 of shell surface

GRADE DIRTY
Cage marks of adhering material

Figure 3. Examples of different eggs with cage marks or adhering.

Stains

Eggs with stains can be Grade B or Dirty 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 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.

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. A Grade B egg can have a moderate localized stain covering less than $1/32$ of the shell. For scattered stains, the limitation is $1/16$ of the shell. If the stains on an egg are larger than those listed above, it is a Dirty egg. Figure 4 shows you the relative size of $1/16$ and $1/32$ of the shell surface allowed for scattered and localized stains respectively on a Grade B egg. Figures 5 and 6 shows examples of eggs with stains and their corresponding grades.

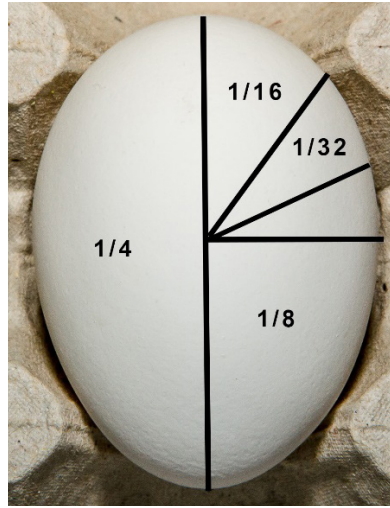


Figure 4. Marked egg showing the amount of shell surface for $1/16$ and $1/32$.

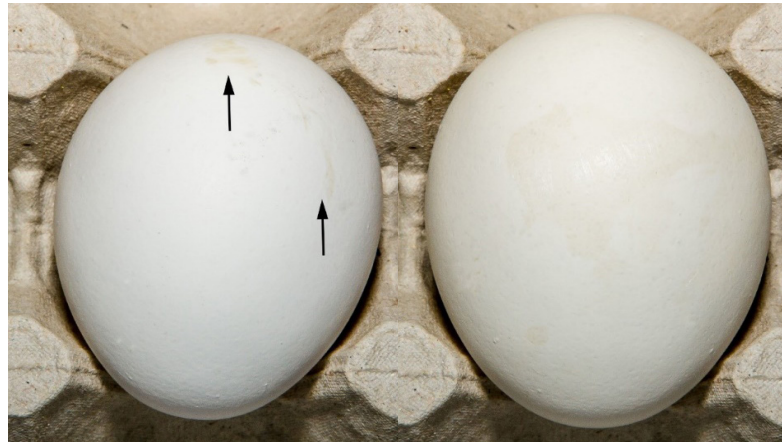
Figure 5. Examples of eggs with localized stains.



GRADE B
Moderate, single (localized) stain covering less than $1/32$ of the shell surface.

GRADE DIRTY
Moderate, single (localized) stain covering more than $1/32$ of the shell surface.

Figure 6. Examples of eggs with scattered stains.



GRADE B
Two (scattered) stains covering less than $1/16$ of the shell surface.

GRADE DIRTY
Multiple (scattered) stains covering more than $1/16$ of the shell surface.

Adhering Material

Eggs with adhering or foreign material (3-dimensional) larger than a speck (about 1.0 mm) are considered Dirty 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 7). It also includes a feather. Even though these things can be washed off, the eggs are graded 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 anyway.



Figure 7. Examples of eggs with adhering material (left to right: yolk, manure, feather, uric acid). All four eggs would be graded as Dirty eggs.

Shape

A Grade A egg should have a “typical” egg shape (see Figure 2). 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 8). 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 9).



Figure 8. Example of Grade B eggs for shape. The egg on the left is too round; the one on the right is too long.



Figure 9. Examples of Grade B eggs because of odd shape.

Shell Texture

Shell texture is determined by calcium deposits, ridges, and shell roughness. 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.

Calcium Deposits

Shells with large calcium deposits (greater than 1/8 inch in diameter) are Grade B (see Figure 10). Grade A eggs are allowed smaller calcium deposits (see Figure 11). 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 classified 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. Each calcium deposit is evaluated on its own and multiple deposits are not added together. Therefore, eggs with small calcium deposits over the entire shell may be classified as Grade A if otherwise qualified (see Figure 11).

Ridges

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 12).



Figure 10. Examples of Grade B eggs based on calcium deposits.



Figure 11. Example of Grade A egg with multiple small calcium deposits in the small end, each of which is too small to downgrade the egg.



Figure 12. Examples of Grade B eggs based on the presence of ridges.

Shell Roughness

A related condition is shell roughness, without distinct ridges (see Figure 13). It is common, however, to see both conditions on the same egg (see Figure 14).

Body Checks

Body checks are another type of faulty shell that result in downgrading of eggs. Body checks are eggs that 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 15). 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 16).



Figure 13. Example of Grade B egg on the basis of shell roughness.



Figure 14. Example of a Grade B egg with both rough shell and ridges.



Figure 15. Grade B eggs because of a body check.



Figure 16. Examples of Grade B eggs for body checks which are visible as bulges small end of the shell.

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 17 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 18 which has a weak area (or “window”) in the large end of the shell. Both eggs would be Grade B.

Loss Eggs

Starting with the 2021 poultry judging contest, a new category was added for exterior eggs—Loss eggs. Loss eggs are checked eggs or leaker eggs. A checked egg is an egg that has a broken shell or a crack in the shell, but its shell membranes are intact, and the egg contents do not leak. It should be marked as a Loss egg (see Figure 19). A leaker is an egg that has a crack and break in the shell and the egg contents are exuding or free to exude through the shell and should be classified as a Loss. **The 4-H poultry judging contest, however, does not use leakers.**



Figure 17. Example of a Grade B egg because of a thin spot.

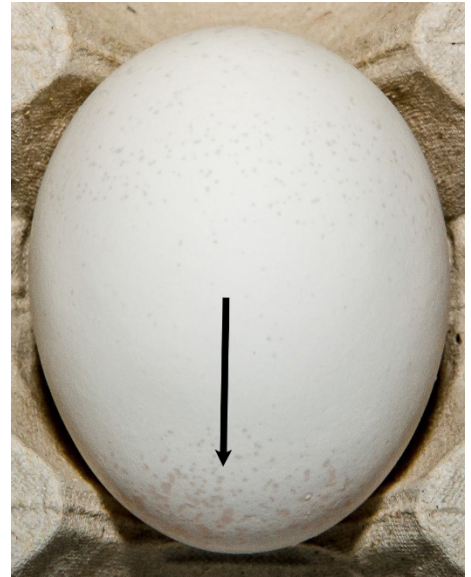


Figure 18. Example of a Grade B egg for small thin spots (called windows) in the shell in the small end.



Figure 19. Examples of Loss eggs

Score Card

In the 4-H poultry judging contest there are two classes of twenty eggs each. Examples of the score cards for these two classes is shown in Figure 20. The cards 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 box is marked will be scored as zero. If two boxes are marked for an egg, the lower score will be taken.

Internal 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 Loss. Some eggs are evaluated as 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 21).

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

J-16

Contestant #: _____
 Name: LESLIE DOE
 County: Magoffin
**KENTUCKY 4-H
 POULTRY JUDGING EVENT**

CLASS H: EXTERIOR Egg Quality

Egg No.	Quality				Score
	A	B	Dirty	Loss	
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: _____ / 100

(Scoring: Lose 2 points for crossing the line between A/B; 2 points for crossing the line between B/Dirty; and 1 point for crossing the line between Dirty/Loss)

J-16

Contestant #: _____
 Name: LESLIE DOE
 County: Magoffin
**KENTUCKY 4-H
 POULTRY JUDGING EVENT**

CLASS I: EXTERIOR Egg Quality

Egg No.	Quality				Score
	A	B	Dirty	Loss	
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: _____ / 100

(Scoring: Lose 2 points for crossing the line between A/B; 2 points for crossing the line between B/Dirty; and 1 point for crossing the line between Dirty/Loss)

Figure 20. Example of score cards for the two classes of exterior egg grading in the Kentucky state 4-H poultry judging contest.

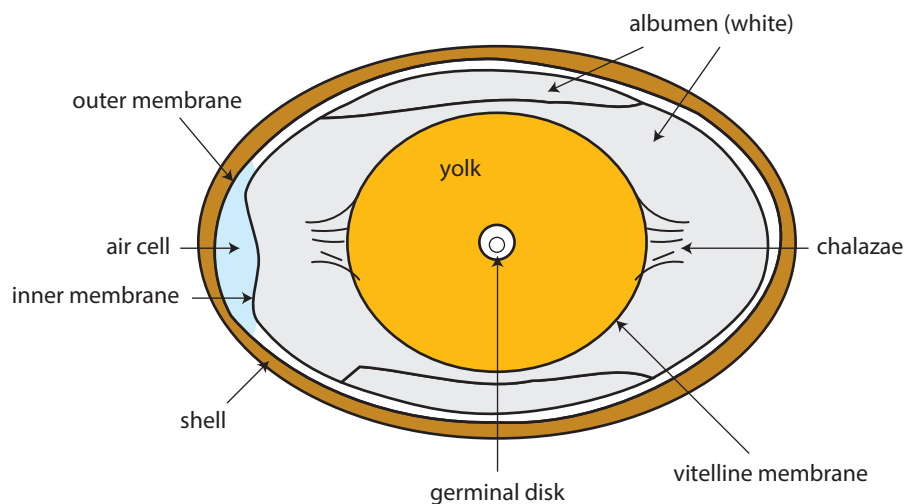


Figure 21. Diagram showing the parts of an egg.

the air cell. Air cell size, therefore, is a good indication of interior egg quality and can be evaluated without breaking the egg open.

When an egg is broken open it is possible to see the parts making up the egg contents (see Figure 22). 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. 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.

Interior Egg Quality by 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 23). 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 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 will allow you to determine if a meat or blood spot is present. If so, this will immediately make the egg a "Loss" 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 24 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. Meat spots are usually in the albumen and have a halo (clear spot) around them.

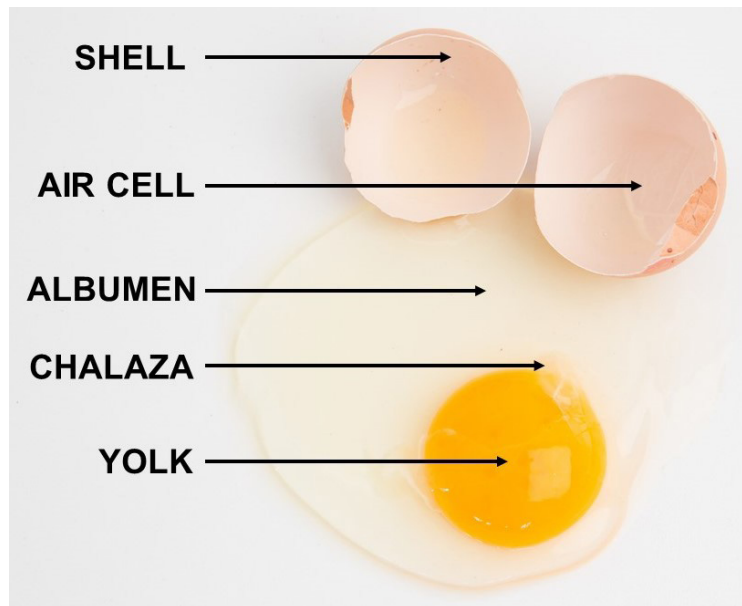


Figure 22. Parts of an egg.



Figure 23. Demonstration of holding an egg up to a candler.

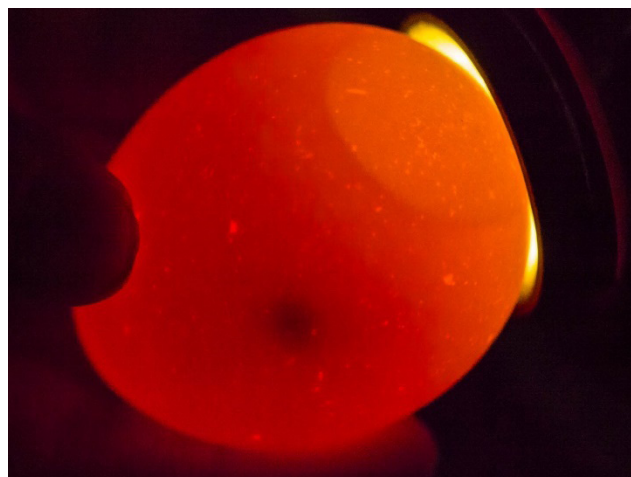
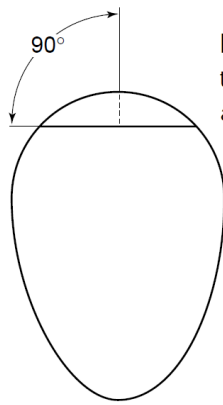


Figure 24. Example of a candled egg with a blood spot. It would be graded as a Loss egg.

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 25). Eggs with air cells less than 1/8 inch deep are Grade AA. Eggs with an air cell greater than 1/8 inch deep but less than 3/16 inch is a Grade A. Anything greater than 3/16 inch is a Grade B.

The grading card in Figure 25 is a training tool only and can NOT be used in a poultry judging contest.

Examples of candled eggs are shown in Figure 26. 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.



Point from which to measure air cell depth

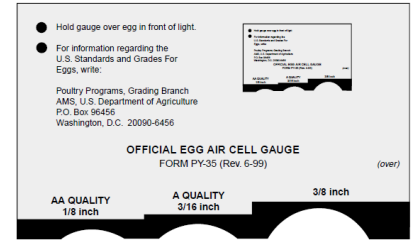


Figure 25. How the USDA egg grading card is used in grading eggs by candling. Grading cards cannot be used in the contest.

Class Set Up

In the 4-H poultry judging contest there are two candling classes of 20 white-shelled eggs each. For each class, the 20 eggs are divided up and placed five eggs on each of four egg flats. Participants are required to rotate through the four candlers placed next to these flats in order to candle all 20 eggs in the class. The number of the egg will be written directly on each egg.

Figure 26. The use of the USDA air cell gauge to determine air cell depth in eggs. Grading cards cannot be used in the contest.



GRADE AA
Air cell depth less than 1/8 inch.

GRADE A
Air cell depth more than 1/8 inch allowed for Grade AA.

GRADE A
Air cell depth less than 3/16 inch allowed for Grade A.

GRADE B
Air cell depth more than the 3/16 inch allowed for a Grade A egg.

Score Card

An example of a properly filled out score cards for grading interior quality of eggs by candling is shown in Figure 27. 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. When marking your card make sure that you are marking the grade for the correct egg. Any egg that does not have a box marked will be scored as zero. If an egg has two boxes marked, the lower score will be used.

Interior Quality of Broken-out Eggs

In a 4-H poultry judging contests, participants are required to grade a group of eggs broken out on to plates. The grades are AA, A, B or Loss based on albumen height, yolk size and flatness, and the presence or absence of blood/meat spots.

Contestant #: S-92
 Name: Jasmine DOE
 County: Kenton
KENTUCKY 4-H
POULTRY JUDGING EVENT
CLASS J: INTERIOR Egg Quality

Egg No.	Quality				Score
	AA	A	B	LOSS	
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: _____ / 100
 (Scoring: Lose 1 point for crossing lines between AA/A and A/B and 3 points for crossing the line between B/Loss)

Contestant #: S-92
 Name: Jasmine DOE
 County: Kenton
KENTUCKY 4-H
POULTRY JUDGING EVENT
CLASS K: INTERIOR Egg Quality

Egg No.	Quality				Score
	AA	A	B	LOSS	
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: _____ / 100
 (Scoring: Lose 1 point for crossing lines between AA/A and A/B and 3 points for crossing the line between B/Loss)

Figure 27. Examples of filled out score cards for egg candling classes in the Kentucky 4-H poultry judging contest.

Loss Eggs

Loss eggs are those that contain blood or meat spots greater than 1/8 inch (see Figures 28 and 29). Eggs with blood or meat spots totaling less than 1/8 inch in diameter are classified as Grade B. It is important to not confuse bits of chalazae as meat spots. Pieces of chalaza may break off and be visible in the albumen (see Figure 30).

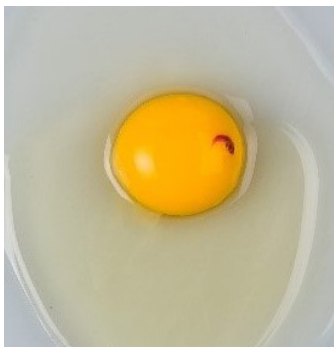


Figure 28. Example of a broken-out egg with blood spots. It would be graded as a Loss egg.



Figure 29. Example of a broken-out egg with a meat spot. It would be graded as a Loss egg.

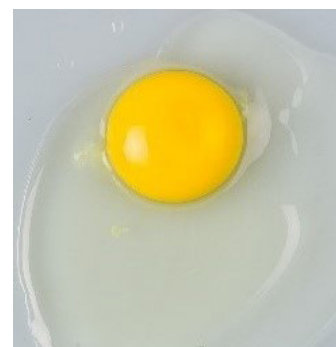


Figure 30. Example of a broken-out egg with pieces of chalaza in the albumen. This is not an egg categorized as a Loss egg.

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.

Grade Determination

The criteria used to grade broken-out eggs include the height of the thick albumen as well as the yolk's size and flatness. For a Grade AA egg, the thick albumen is in the shape of an egg and the yolk sits off the plate when viewed from the side (see Figure 31).

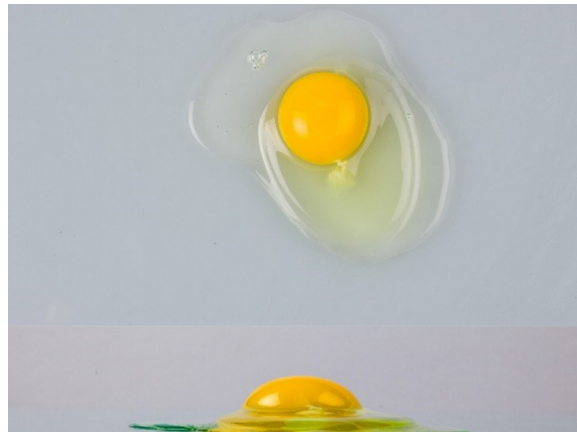


Figure 31. Example of a broken-out Grade AA egg. Note that the albumen (also known as egg white) is thick and firm. The area covered by the albumen is small. There is a large proportion of thick white relative to thin white.

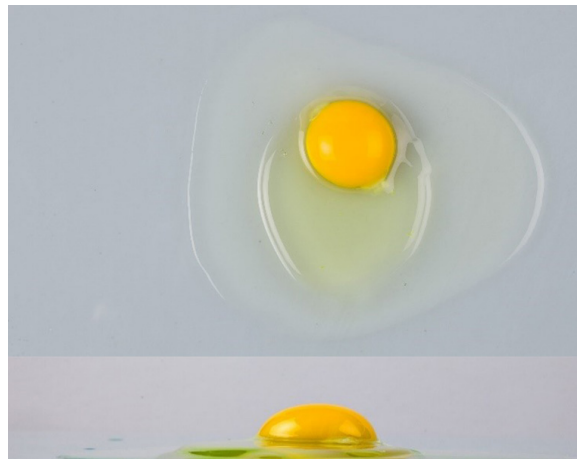


Figure 32. Example of a broken-out Grade A egg. Note that the albumen is still reasonably firm but not as high as in the Grade AA egg. The area covered by the albumen is still reasonably small, but definitely different than for the Grade AA egg.

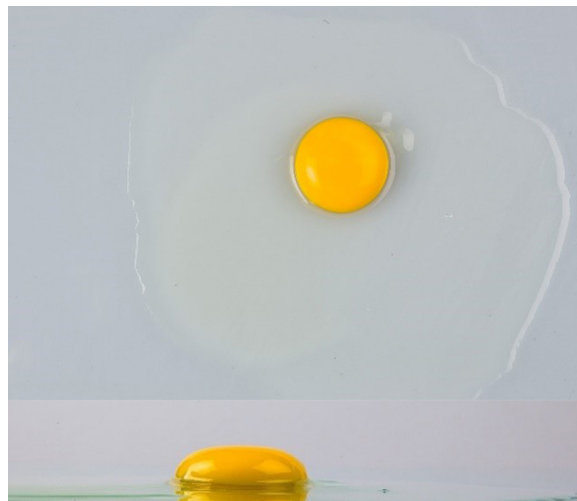


Figure 33. Example of a broken-out Grade B egg. Note that the egg whites are thinner than the other two eggs. The yolk appears flat. The albumen spreads out much more and there is much more thin albumen relative to the amount of thick albumen.

For a Grade A egg, the albumen is losing its egg shape and sits lower on the plate. The edges of the thick albumen have a rounding of the edges. You can no longer see under the yolk when the egg is viewed from the side (see Figure 32).

For a Grade B broken-out egg, the yolk is flattened, and the thick albumen is almost all gone (see Figure 33).

Participants should evaluate each broken-out egg on its own merit and not compare it with other eggs in the class. The diameter of the outline of the thick albumen (top view) may give an indication of grade; however, the height of the thick albumen (side view) is the most important factor in determining grade.

Table 1. Summary of USDA standards for the exterior quality of table eggs.

Factor	Grade			
	AA/A	B	Dirty	Loss
Stain	Clean – 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 to moderate localized stain covering less than 1/32 of the shell or Scattered stains covering less than 1/16 of the shell surface	Prominent stains or Slight to moderate localized stain covering more than 1/32 of the shell or scattered stains covering more than 1/16 of the shell surface	N/A
Adhering Dirt or Foreign Material	N/A	N/A	Any adhering dirt or foreign material	N/A
Egg Shape	Approximately the usual egg shape	Unusual or decidedly misshapen (long, round, or distorted)	N/A	N/A
Shell Texture	May have rough areas and small calcium deposits that do not materially affect shape or strength	Extremely rough area that may be faulty in soundness or strength May have large calcium deposits	N/A	Checked: Broken or cracked shell, but no leaking Leaker: Has broken or cracked shell with membranes broken and contents leaking or free to leak
Ridges	Free of ridges	May have pronounced ridges	N/A	N/A
Shell Thickness	Free of thin spots	May have pronounced thin spots	N/A	N/A
Body Checks	Absence of body checks	May have pronounced body checks	N/A	N/A

Score Card

The score card for grading broken out eggs is similar to the one for candling (see Figure 34). 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. Any egg that does not have a box marked will be scored as zero. If an egg has two boxes marked, the lower score will be used.

Contestant #: S-76
 Name: NATE DOE
 County: Perry
KENTUCKY 4-H
POULTRY JUDGING EVENT
CLASS L: BROKEN OUT Egg Quality

Egg No.	Quality				Score
	AA	A	B	Loss	
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: _____ / 100
 (Scoring: Lose 1 point for crossing lines between AA/A and A/B; 3 points for crossing the line between B/loss)

Figure 34. Example of a filled-out score card for the broken-out egg class.

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