

INTRODUCTION

This manual has been developed as a study guide for the Florida State Fair Poultry Skillathon which is part of the Champion Youth Program. The topic for this year's Skilathon is **Products and Marketing**.

The Florida State Fair recognizes that agricultural education instructors, 4-H agents, parents, and leaders provide the traditional and logical instructional link between youth, their livestock projects and current trends in the animal agriculture industry. **PLEASE NOTE:** This manual is provided as a **study guide** for the skillathon competition and should be used as an additional aid to ongoing educational programs.

Sections are labeled **Junior, Intermediate & Senior, Intermediate & Senior, or Senior** to help exhibitors and educators identify which materials are required for each age level.

****** Denotes additional information in the study manual for preparing for the Champion of Champions competition.

The knowledge and skills vary by age group and may include:

Juniors (age 8-10 as of September 1, 2020)

Parts of the Egg,
Poultry Production
Exterior Egg Quality

Intermediates (age 11-13 as of September 1, 2020)

all of the above plus...
Retail Parts,
Interior Egg Quality (Breakout & Candling)
Cookery

Seniors (age 14 and over as of September 1, 2020)

all of the above plus....
Carcass Grading
Skeletal Anatomy
Vertical Integration

GOOD LUCK!

Poultry Products and Marketing***

Youth poultry projects focus on the selection, raising, showing and often selling of birds and/or eggs. By virtue of their participation in poultry projects, youth become part of an industry that provides food for the world. The steps involved in the movement of poultry and poultry products from producer to consumer are known as *processing and marketing*. Tremendous changes have occurred over the years in the ways poultry products are harvested and marketed but the fundamentals remain the same. Price is dependent on *supply and demand*. We can impact supply through increased or decreased breeding but demand is more difficult to affect. In order to maintain a stable market for poultry products, consumers must have confidence in the **wholesomeness and quality** of what they are buying. That means products must be safe, nutritious and tasty.



In 2020 the poultry industry was the fourth largest money-generating commodity in modern agriculture (corn ranks #1). About 45% of the cash receipts from U.S. agriculture each year are generated from **animal agriculture** and 10% of animal agriculture's share is from poultry with reported annual revenue of over \$39 billion.

<http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics.aspx#27415>

The *U.S. Poultry and Egg Association* (<http://uspoultry.org/>) is a non-profit organization made up of producers and processor of broilers, turkeys, ducks, eggs and breeding stock as well as companies that provide goods and services. They channel funds into programs focused on promotion, education, communication and research related to the poultry industry in America. They partner with state affiliates and other national organizations to work on common problems. They conduct the International Poultry Expo, the world's premier poultry exposition. Their mission is to increase the quality and safety of poultry products while promoting responsible practices in animal care and environmental stewardship.



The American Poultry Association (<http://www.amerpoultryassn.com/>) is made up of purebred producers. The APA strives to promote and protect the standard-bred poultry industry. It is responsible for the publication of the American Standard of Perfection, sanctions poultry shows and certifies poultry judges. Their youth affiliate is known as the APA/ABA Youth Poultry Club. The Florida chapter has an active Facebook page: <https://www.facebook.com/APA-ABA-Youth-Poultry-Club-Florida-437049806316057/>.

TYPES OF POULTRY OPERATIONS

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Most large poultry operations specialize in producing either eggs, broilers/meat chickens, or turkeys. Other types of poultry producers raise ducks, quail, game birds, show birds, and other poultry species.

Though youth projects are centered on purebred breeds and showing, the poultry industry as a whole consists of three major types of production enterprises.

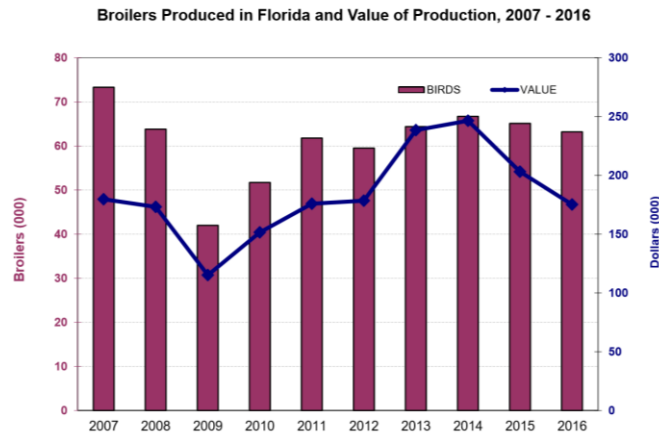
1. Broiler production - Meat-type chickens, sometimes called fryers, comprise 68% of the total value of poultry production. Commercial broilers are crossbreeds, primarily produced by crossing White Cornish males with White Plymouth Rock females. Both the male and female broilers are raised to produce meat.
 - a. Cornish Game Hens - harvested about 4 weeks of age; 2 lbs. or less.
 - b. Broiler/Fryer – young chickens 6-10 weeks of age; over 2 lbs.
 - i. Chicken for fast food restaurants – 6 weeks of age; 4.1 lbs.
 - ii. Chicken for grocery stores – 7.5 weeks of age; 6.0 lbs.
 - iii. Deboned chicken for sandwiches, nuggets, etc. – 8.5 weeks of age; 7.5 lbs.
 - c. Roasters – 7-12 weeks of age; over 5 lbs (10.5 lbs. average)
 - d. Heavy Fowl – culled breeding hens or roosters, also called ‘baking hens’, usually over 10 months of age and over 4 lbs.
 - e. Light fowl – culled laying hens, usually over 10 months of age and usually about 2.5 lbs. Sometimes called ‘stewing hens’.
 - f. Capon – neutered male chickens, typically less than 4 months old.
 - g. Rooster – adult males typically 10 months or older and over 6 lbs.
2. Egg production - for human consumption (not for incubation), 17% of total production value. Hens lay an average of 270 eggs/year beginning at 19 weeks of age. Older hens produce larger eggs.
3. Turkey production - 12% of the total value of poultry production



POULTRY INDUSTRY IN FLORIDA

Florida has both commercial broiler and egg operations. Florida currently ranks 14th in egg production and 15th in the number of laying hens on farms. In 2016, Florida egg farmers reported having 8,283,000 laying hens and 1,842,000 pullets. These hens laid an average of 276 eggs each per year, producing 2,364,000,000 eggs in 2016 on Florida farms valued at \$110,028,000.00.

Florida ranked 18th in the number of broilers and 17th in the pounds of chicken meat produced in 2016. In that year Florida farmers grew 63,200,000 broiler chickens that produced 366,600,000 pounds of chicken meat, valued at \$175,235,000.00.



Livestock, Dairy & Poultry Summary – 2016 (June 2017)
USDA, National Agricultural Statistics Service

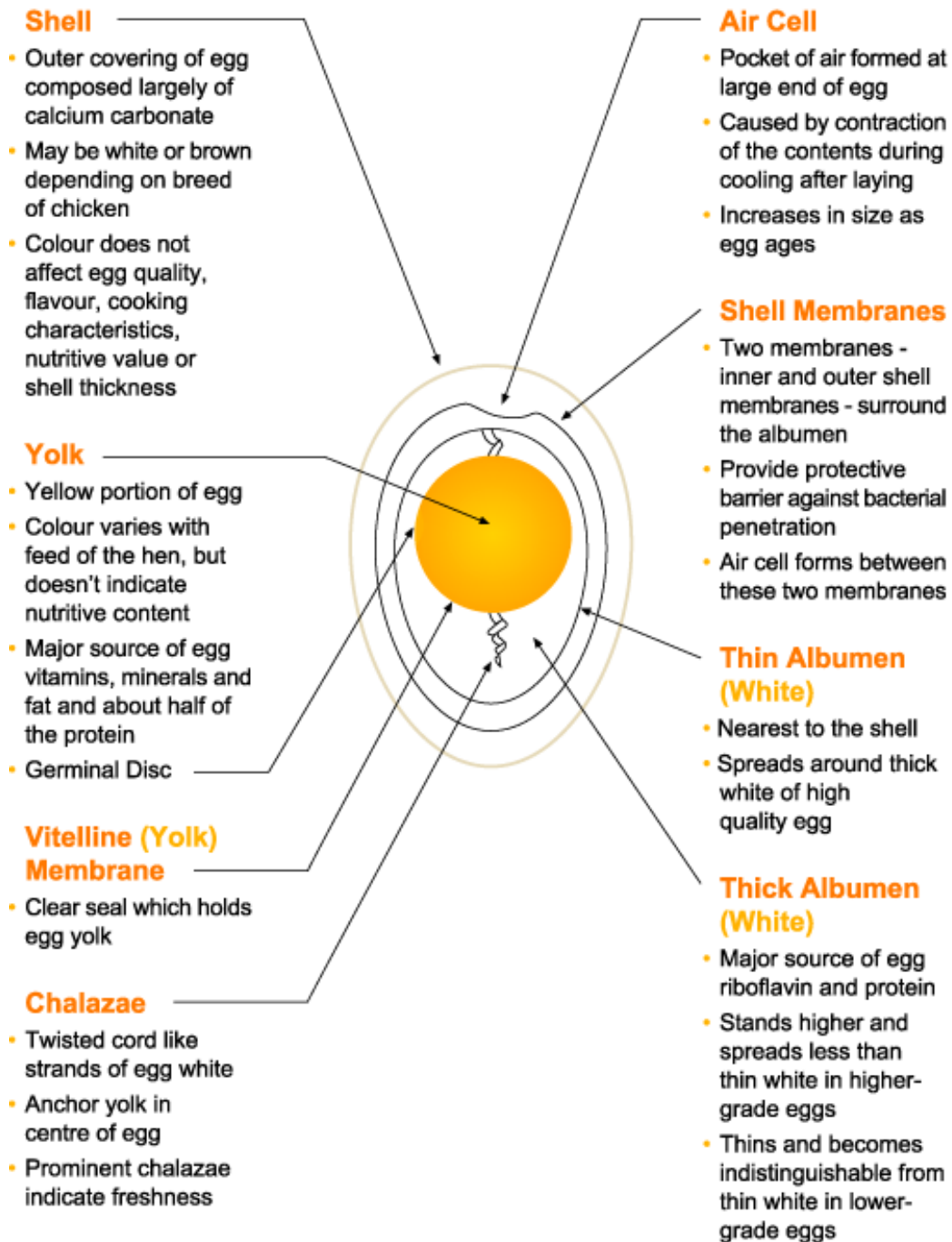
U.S. EGG INDUSTRY

The U.S. is second to China in egg production (109 billion vs. 450 billion in 2018). Most eggs are considered “table eggs” but about 25% of the eggs produced in the U.S. are taken to an egg products plant instead of being sold in the shell. The eggs are mechanically broken, the yolk can be separated from the whites if desired, the liquid egg is pasteurized and then it can be made into a variety of products such as whole egg, egg yolks, egg whites, scrambled egg mixes, etc. which can be dried, frozen or used fresh. These products are marketed to bakeries and to companies that make items like egg noodles, mayonnaise, cake mixes and items for military personnel.

PARTS OF AN EGG

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The *American Egg Board* is the producer's link to consumers in communicating the value of the egg to increase demand for eggs and egg products (<http://www.aeb.org/>). Even though we eat eggs regularly, we don't often think about the parts of the egg. Study the illustration and web sites below to learn more about the "incredible, edible, egg™". <http://www.incredibleegg.org/> Another good source for the parts and function of an egg is the Virginia Tech 4-H Virtual Farm website: https://www.sites.ext.vt.edu/virtualfarm/poultry/poultry_eggparts.html



EGG QUALITY

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In commercial egg-processing plants, eggs are graded simultaneously for interior and exterior quality while they are inspected for wholesomeness. However, in the Skill-a-thon, all participants will grade eggs for exterior quality while only intermediates and seniors will grade eggs for interior quality.

Exterior Egg Quality

USDA Grades for exterior egg quality are A, B and Dirty (Grades AA and A have identical exterior quality standards). They are evaluated on the basis of texture, color, shape, soundness and cleanliness (see Table 1). The shell of each egg should be smooth, clean, and free of cracks. Some of the common defects in exterior egg quality include: stains, adhering material (yolk, manure, etc.), odd-shaped eggs, and rough shells.

Table 1. Summary of USDA grades for exterior egg quality.			
Factor	Grade AA or A	Grade B	Dirty
Stain	Clean but may show small specks, stains or cage marks that do not detract from general clean appearance of the egg and may show traces of processing oil	Slight or moderate localized stains less than 1/32 of shell or scattered stains less than 1/16 of shell	Prominent stains; or slight or moderate stains covering greater than 1/32 if localized and 1/16 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 shape	Unusual or decidedly misshapen (e.g., very long or distorted)	
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 from thin spots	May show pronounced thin spots	
Body checks	Free from body checks ¹	May show pronounced body checks ¹	
<p>¹ A body check is an egg which looks like the shell was cracked, but the shell is in fact still intact. Body checks result when the egg is cracked when the shell is being formed in the hen's body and then partially calcified before being laid. Body checks may appear as fracture lines which are visible to the naked eye or as ridges or bulges associated with the area of shell which was fractured.</p>			

You can watch a video explaining the exterior quality of eggs by visiting the following web site:

<https://www.youtube.com/watch?v=NzCaKdPHgPI>

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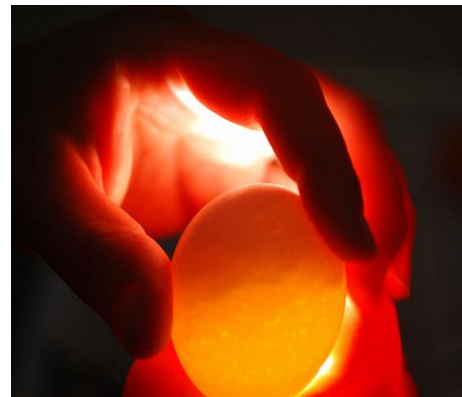
Interior Egg Quality

The USDA grades for interior egg quality are AA, A, B and Inedible. (see Table 2). Interior quality can be evaluated by candling eggs or by breaking them out.

Table 2. Summary of USDA grades of interior egg quality.				
Factor	Grade AA	Grade A	Grade B	Inedible
Air cell	1/8 inch or less in depth	3/16 inch or less in depth	more than 3/16 inch in depth	Doesn't apply
Egg white	clear, firm	clear, may be reasonably firm	clear, may be weak and watery	Doesn't apply
Yolk	outline slightly defined	outline may be fairly well defined	outline clearly visible	Doesn't apply
Blood/meat Spots	none	none	blood or meat spots aggregating not more than 1/8 inch in diameter	blood or meat spots aggregating more than 1/8 inch in diameter

Candling Eggs

The interior quality of an egg can be evaluated without breaking it open. The egg is held up to a light in a process called candling. To candle an egg, hold the large end up to the candling light in a slanting position. The air cell is nearly always in the large end of the egg. Hold the egg between your thumb and first two fingers. Then, by twisting your wrist quickly, you can cause the inside of the egg to whirl. This will tell you a great deal about the yolk and white. Older eggs, or eggs that are of poor quality will have a large air cell and the yolk will be more visible and mobile. A meat or blood spot will show up as a dark or red foreign substance in the egg.



In the Skill-a-thon, air cell size and the presence of blood or meat spots are the only two factors used to determine interior quality egg grade. If a blood or meat spot is present, and greater than 1/8 inch, the egg is Inedible. If a blood or meat spot is less than 1/8 inch, or if there is no blood or meat spot, then the grade is determined on the basis of air cell depth. The depth of the air cell is the distance from its top to its bottom when the egg is held with the air cell up. In a newly laid egg, the air cell is small, not more than 1/8 inch deep. As the egg ages, especially if not refrigerated, evaporation takes place, the air cell becomes larger and the egg is downgraded. You can practice judging interior egg quality by candling by visiting:

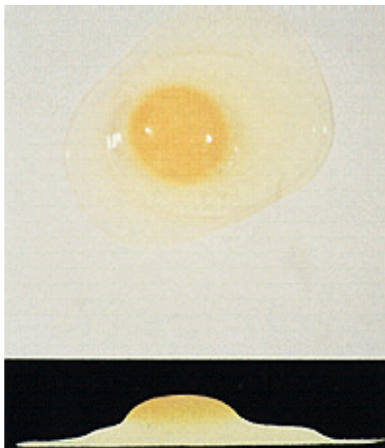
<https://www.youtube.com/watch?v=Jz8w76s57Po>

Broken-Out Eggs

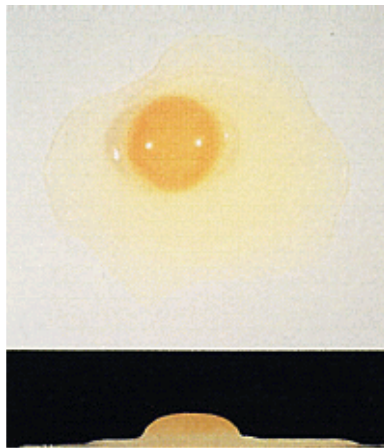
Commercially, eggs are candled to remove any Inedibles, and to ensure that the egg has an acceptable appearance when broken out, especially when fried (e.g., you don't want the egg white spread out all over the frying pan). As an egg ages and becomes poor in interior quality, the egg white (albumen) becomes thin and will spread or flatten when the egg is broken out. The yolk will be flat and very easily broken. Eggs of good quality will have firm albumen (egg white) that is compact and upstanding. The yolk will stand up and be round in appearance. The main criteria that should be used to grade broken-out eggs that do not have blood or meat spots is the height of the thick albumen relative to the size of the egg.

Eggs with very small spots less than 1/8 inch in diameter (Grade B) will not be intentionally used. If the albumen is tinted with blood, then the egg is classified as inedible, because there is blood in the albumen, although it does not appear as a blood spot. Practice judging interior egg quality by broken-out quality at the website:

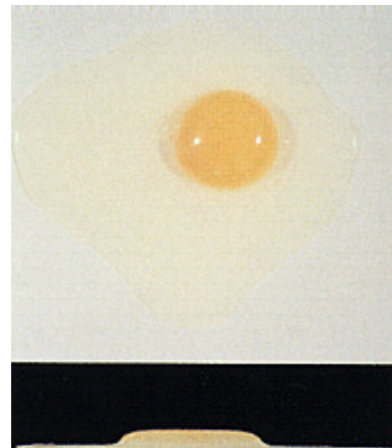
https://www.youtube.com/watch?v=bE0qDjd_XAA



GRADE AA



GRADE A



GRADE B

RETAIL PARTS

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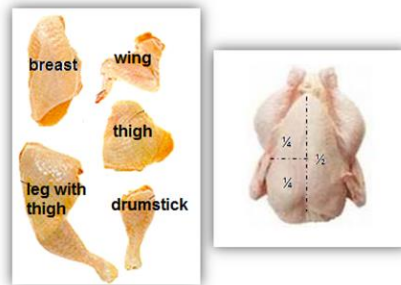
Chicken carcasses are marketed whole or cut up into parts. These parts are somewhat similar to retail cuts of beef and pork. It is important to learn to identify the retail parts of chicken. Learn more by visiting: <https://extension.uga.edu/content/dam/extension-county-offices/dawson-county/4h/PartsID.pdf>

The typical parts are:

Whole breast
Breast quarter
Breast with ribs (whole breast with ribs)
Split breast (split breast with ribs)
Boneless breast (boneless, skinless, whole breast)
Breast tenderloin (tenderloin)
Back
Neck
Giblets: (liver, heart, gizzard)

Leg quarter
Whole leg (leg)
Boneless thigh (boneless, skinless thigh)
Drumstick
Thigh
Wing
Drummette
Flat (Wing portion)

Note: Names used by FFA are in parentheses



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Poultry Preparation

Chicken from Farm to Table Like all fresh meats, chicken is perishable and should be handled with care. Proper handling and cooking of chicken completely eliminates the risk of bacterial infection. The Food Safety Inspection Service has a large number of fact sheets on all aspects of safe handling, cooking and storage.

http://www.fsis.usda.gov/fact_sheets/chicken_from_farm_to_table/index.asp#1

Poultry Facts

Fresh or Frozen – poultry stored at or below 0°F MUST be labeled frozen

Dating – voluntary statement such as use by or sell by is for quality assurance

Hormones & Antibiotics – no hormones are used in the raising of chickens; antibiotics used to prevent disease or improve feed efficiency must follow withdrawal period.

Additives – are not allowed on fresh chicken

Foodborne organisms – bacteria grow rapidly on raw or undercooked chicken between 40 & 140 °F. Freezing does not kill bacteria but thorough cooking does. Never let raw product or juices contact already cooked food or food that will be eaten raw. Salmonella, E. coli, listeria and campylobacter are the more common bacteria associated with chicken.

Four food safety steps are: Clean, Separate, Cook (165 °F), Chill (promptly)

Rinsing or soaking chicken before cooking is not recommended

Fresh chicken must be kept cold. Pick up chicken last before checkout, put in bag to prevent leakage, immediately refrigerate, use within 1-2 days or freeze.

Prepared chicken should be hot when purchased and used within 2 hours or covered in refrigerator and used within 3-4 days or frozen.

To thaw safely, place in the refrigerator, in cold water or in the microwave. Chicken thawed in

the refrigerator can be refrozen but cold water or microwave thawed chicken should be cooked immediately after thawing.

Chicken Cooking Methods

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Chicken can be cooked by dry heat or moist heat. Dry heat cookery methods improve flavor of meat through crust formation and caramelization but increase chewiness and decrease tenderness because of protein hardening. Cookery under moist conditions for long periods at relatively low temperatures generates steam that then converts the collagen in connective tissue into gelatin. Methods should be selected based on desired quality characteristics of the resulting product, available cooking facilities/equipment, and the amount of time available for preparation. Test chicken for doneness by using a meat thermometer or insert the point of knife into the thickest part of the thigh. If the chicken is cooked, the juice will run clear with no track of pink.

Roasting - recommended for whole birds. Meat is seasoned and placed in an open roasting pan with a cooking thermometer placed in the center to determine degree of doneness.

Broiling - Meat is directly exposed to the source of heat from above or from both sides at the same time. It involves high heat and produces a distinct caramelized flavor. The intense heat of the broiler quickly seals the succulent flesh beneath a crisp, golden exterior. Breast meat, if cooked in one piece, can be rather dry, so it is best to cut it into chunks. Chicken wings are best for speedy broiling.

Grilling - actually a method of broiling. Chicken is terrific grilled over coals, heated ceramic briquettes or an open fire. If using barbecue sauce, put it on at the very end and turn the temperature down to prevent burning.

Pan-Broiling - faster and more convenient than oven broiling and good for cooking smaller pieces. It involves conduction of heat by direct contact of the meat with hot metal. Fat drippings are poured off as they accumulate.

Sautéing - ideal for small pieces or small birds, such as baby chickens. Heat a little oil or a mixture of oil and butter in a heavy-based skillet. Add the chicken and fry over moderate heat until golden brown, turning frequently. Add stock or other liquid, bring to a boil, then cover and reduce the heat. Cooking gently until the chicken is cooked through.

Stir-Frying - similar to pan-frying except that the food is stirred almost continuously. Skin-less, boneless chicken is cut into small pieces of equal size to ensure that the meat cooks evenly and stays succulent. Cooking is done with high heat.

Deep-Fat Frying - cooking meat immersed in fat. Who doesn't love fried chicken?

Microwave Cookery - High frequency electrical energy causes molecules inside the meat to vibrate creating friction and heat without heating the surrounding air. Though you can microwave chicken frozen or thawed, it is better to thaw the chicken first.

Braising - In some regions of the country the term "fricassee" is used interchangeably with braising. The surface of the meat is seasoned, covered with flour and browned. Afterward the meat is placed in a covered pan with a small amount of liquid and cooked at low temperatures.

Poaching is a gentle cooking method that produces tender chicken and a stock that can be used to make a sauce to serve with the chicken. Cook in a liquid that is not actually bubbling at 165 to 180 degrees. It is also used to cook eggs. It takes one third less time than roasting. Poaching helps keep shrinkage of the meat to a minimum.

Meat Facts ***

100g Roasted	Calories (g)	Fat (g)	Sat'd Fatty Acids (g)	Protein (g)	Iron (mg)
Beef	216	9.9	3.79	29.58	2.9
Chicken	190	7.41	2.04	28.93	1.21
Goat	108	2.58	.79	29	3.3
Lamb	206	9.52	3.4	28.22	2.05
Pork	212	9.66	3.41	29.27	1.1
Rabbit (stewed)	206	8.41	2.51	30.38	2.37

READY-TO-COOK POULTRY

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The USDA sets standards for 7 classes of ready-to-cook chickens:

- 1) Cornish game hen
- 2) Broiler or fryer
- 3) Roaster
- 4) Capon
- 5) Hen or baking or stewing chicken (heavy fowl or light fowl)
- 6) Cock or rooster.

Grading is an optional service offered by USDA's Ag Marketing Service. The USDA grades for ready to cook chickens are A, B and C. In addition to grading poultry, all poultry is inspected during the slaughter process. USDA Inspectors are in the slaughter plants and inspect each chicken for wholesomeness, that is, to determine whether or not it is fit for human consumption.

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Carcass Grading

Carcasses are judged according to USDA grades (see Table 3). In the Skill-a-thon, judging ready-to-cook poultry will be based only on exposed flesh, disjointed and broken bones, and missing parts. You should not grade carcasses based on fleshing, conformation, fat cover, or discolorations such as bruises or dried out areas. In addition, feathers and pin-feathers are not considered in the Skill-a-thon. The carcass weight category used will be 2 to 6 pounds. For more information on ready-to-cook poultry, refer to the following website:

<https://www.youtube.com/watch?v=qnMR1yOVthk&t=6s>



Table 3. Summary of USDA grades for ready-to-cook poultry.
(Minimum requirements and maximum permitted defects)

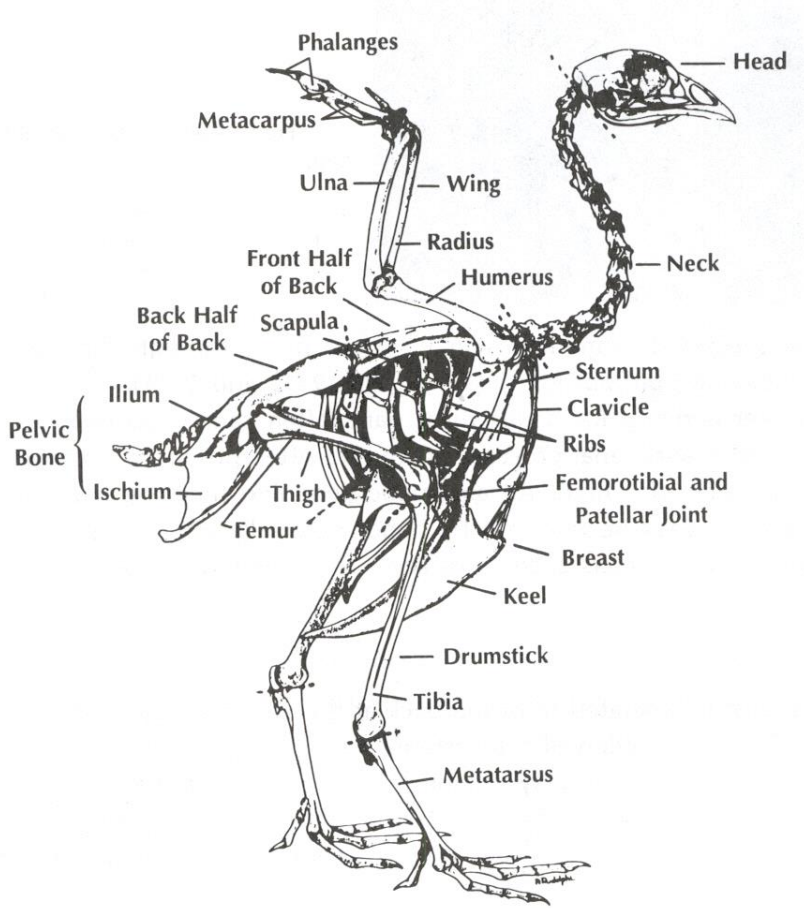
Factor	Grade A	Grade B	Grade C
Exposed flesh¹ <i>Carcass weight:</i> <i>Minimum Maximum</i> None 2 lbs Over 2 lbs 6 lbs Over 6 lbs 16 lbs Over 16 lbs none	<i>Breast & Legs²</i> <i>Elsewhere²</i> 3" 12" 3" 1-12" 2" 2" 2" 3"	<i>All parts²</i> 1/3 of flesh exposed on each part of carcass, provided meat yield not appreciably affected	No limit
Disjointed bones	Can have 1 disjointed	2 disjointed or 1 disjoint & 1 non-protruding broken	No limit
Broken bones	None	1 non-protruding broken	No limit
Missing parts	Wing tips &/or tail removed at the base	Wing(s) to 2nd joint; back area not wider than base of tail and extending less than halfway between base of tail and hip joints	Entire wing(s); back area not wider than base of tail extending to area beyond halfway to hip joints
Conformation: Breastbone	Normal; Slight curve or dent	Moderate deformities; Moderate dented, curved or crooked	Abnormal Seriously curved or crooked
Back	Normal (except slight curve)	Moderately crooked	Seriously crooked
Legs & wings	Normal	Moderately misshapen	Misshapen
Fleshing	Well fleshed, moderately long, deep-rounded breast	Moderately fleshed	Poorly fleshed
Fat covering	Well fleshed, moderately long, deep-rounded breast	Sufficient fat on breast & legs to prevent distinct appearance of flesh through the skin	Lacking in fat covering over all parts of carcass
Pinfeathers: Non-protruding	Practically free	Few scattered	Scattered
Protruding	Free	Free	Free
¹ Longest length for a cut and total area for tears and missing skin based on the whole part. ² For purposes of definition, the parts of the carcass shall be each wing, leg, entire breast and entire back.			

SKELETAL ANATOMY

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Knowledge of the skeleton is important for an understanding of how the various carcass parts are made. For the carcass parts used in the identification portion of judging contests, the following relationship exists:

Carcass part	Bone(s) of the skeleton
Thigh	femur
Drumstick	tibia & fibula
Drummette	humerus
Flat/Wing mid-joint	ulna & radius
Wing tip	metacarpus & phalanges
Wing	humerus, ulna, radius, metacarpus & phalanges
Whole breast	Sternum, keel, clavicles, coracoids, sternal ribs
Breast with ribs	Sternum, keel, clavicles, coracoids, sternal ribs, vertebral ribs
Neck	cervical vertebrae



VERTICAL INTEGRATION

Vertical integration was developed in the poultry industry in the mid 1900's as feed suppliers and manufacturers began to acquire hatcheries and processors to protect themselves financially. Approximately 99% of the broilers raised and half of the eggs produced in the United States are under some type of vertical integration contract.

In the broiler industry, large companies have multiple production complexes, usually in several States. In typical vertical integration, each complex usually has a hatchery, slaughter plant and feed mill. The company usually contracts with some farmers, within about 50 miles of the slaughter plant, to grow breeder chicks to 20 weeks of age. The breeder chicks are purchased from genetic firms that develop strains of chickens selected for rapid growth and high yield of meat. Other farmers are contracted to produce fertile eggs by putting these breeder birds in houses at a ratio of one male to 10 females. The breeder flocks are kept for a 40 wk production period. The fertile eggs are incubated in the hatchery and other farmers are contracted to raise the newly hatched broiler chicks until they are taken to the slaughter plant. Most chickens in the broiler industry are kept on floors covered with wood shavings. Automatic feeders and waterers are used. Most plants harvest about one million broilers per week. The companies directly market most of the products to large grocery store chains and restaurant chains while some go to distributors who market to smaller grocery stores and restaurants.

In the egg industry, large companies have multiple production complexes, but usually in the same State. Frequently the companies originated as family farms and have grown through the years so they have 5 to 25 million laying hens. In typical vertical integration, each complex usually has 5 to 25 houses, an egg processing plant and a feed mill. A complex may have 300,000 to 2 million laying hens with 50,000 to 100,000 per house. Some of the larger companies may also have breeder flocks to produce fertile eggs and a hatchery to hatch the chicks. However, most of the companies buy chicks from genetic firms that develop strains of chickens selected for a high rate of egg production and eggs of a size preferred in the market. The chicks are placed in brooder houses and raised to 18 wks of age, then transferred to layer houses. Here they produce eggs until they are about two years old. The hens are usually in rows of multiple-hen cages with about four rows placed one above the other. Automatic feeders and waterers are used. Also, conveyor belts run in front of the sloped wire cages to take the eggs to the egg processing plant. The eggs are mechanically washed, sanitized, inspected and graded by candling, and most are packaged in one-dozen cartons. The companies directly market most of the eggs to large grocery store chains and restaurant chains while some go to distributors who market them to smaller grocery stores and restaurants.

