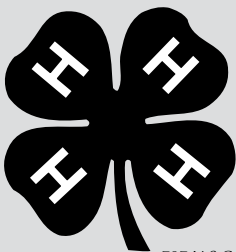
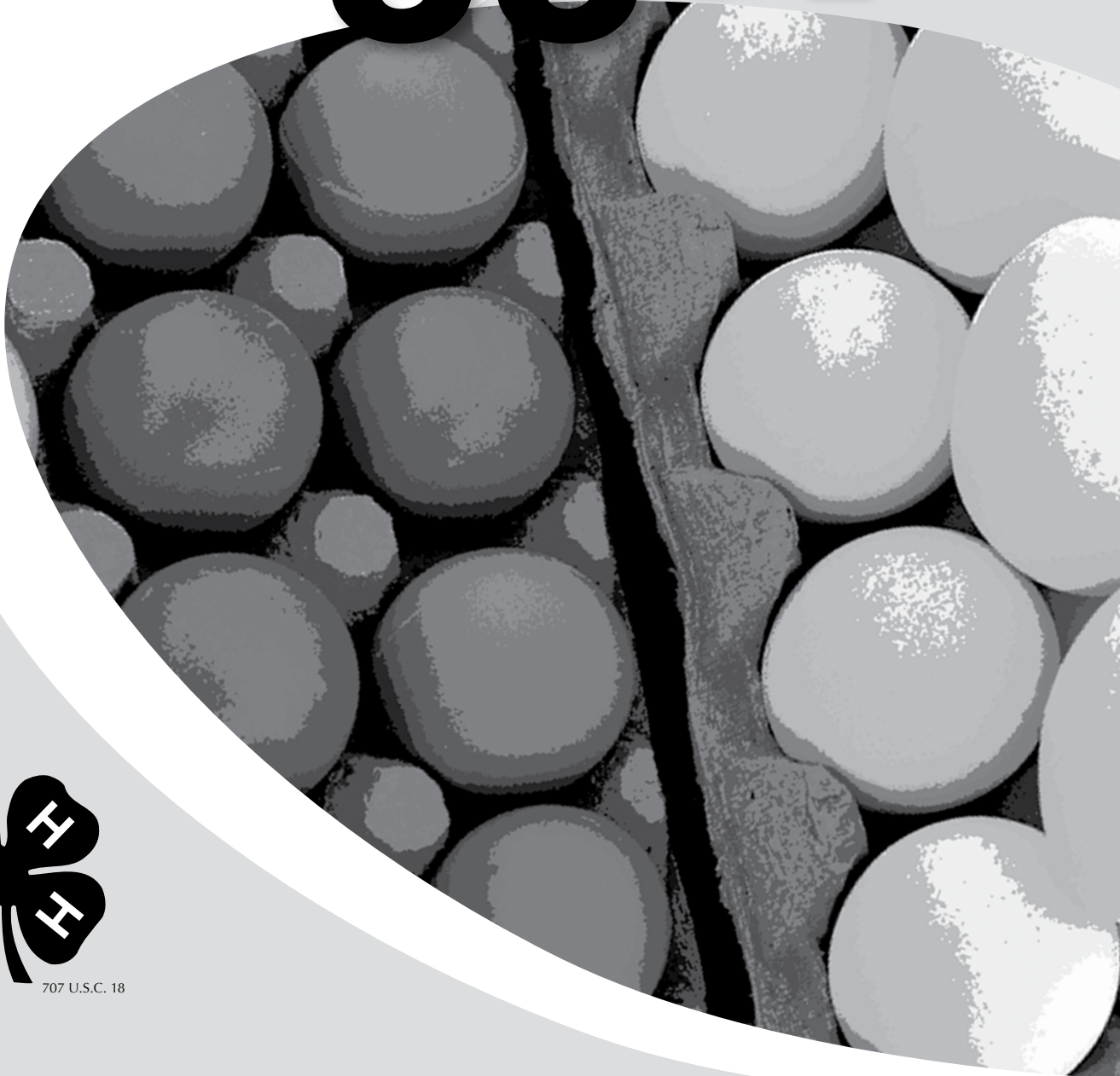


# A Brighter Idea: **Eggs!**



707 U.S.C. 18

**Virginia Cooperative Extension**



# A Brighter Idea: Eggs!

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This booklet is designed to provide a better understanding and use of the Incredible Edible Egg. Not only are eggs nutritious, but they're still one of today's best food buys. Brighten meal planning. Break out the eggs!

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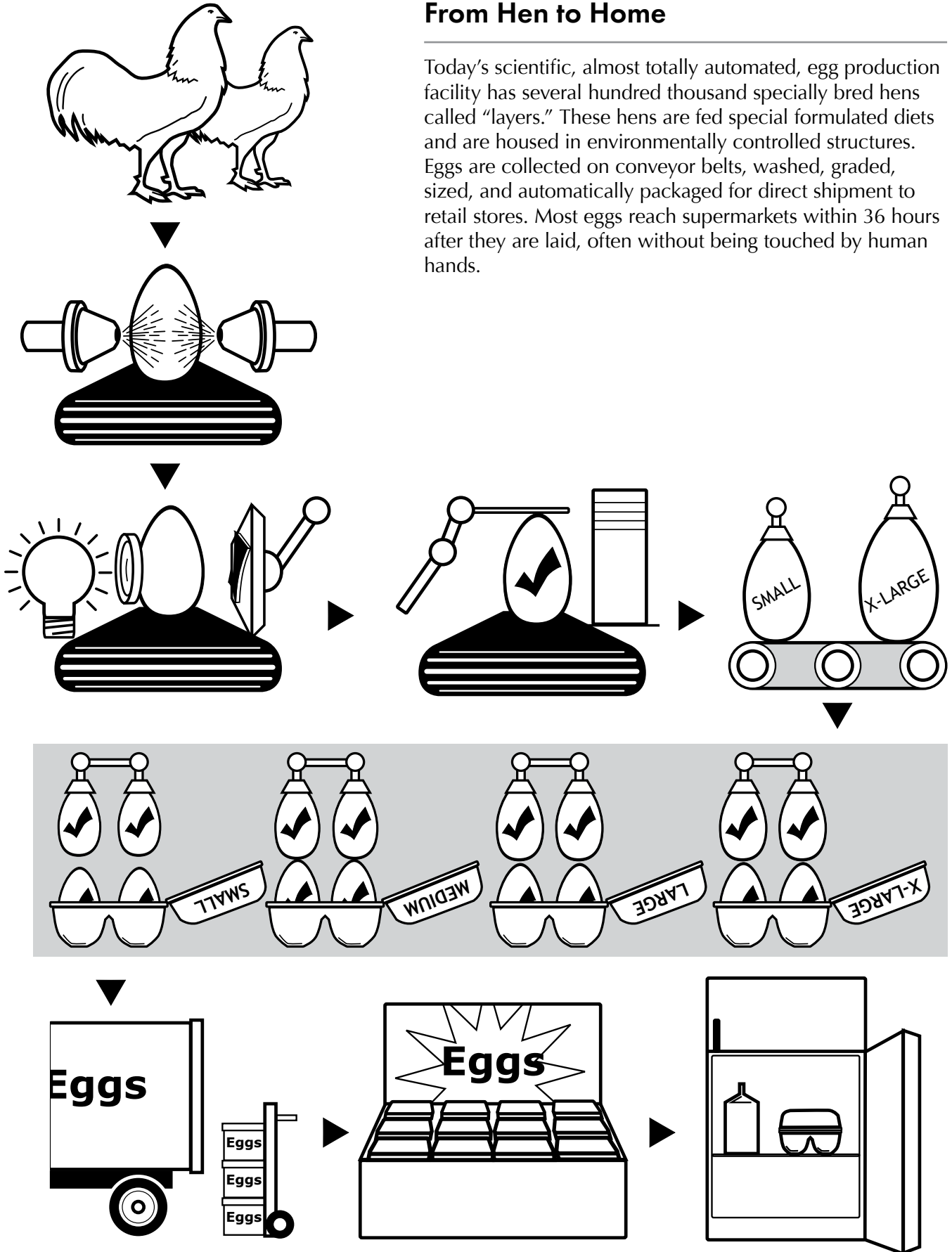
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## From Hen to Home

Today's scientific, almost totally automated, egg production facility has several hundred thousand specially bred hens called "layers." These hens are fed special formulated diets and are housed in environmentally controlled structures. Eggs are collected on conveyor belts, washed, graded, sized, and automatically packaged for direct shipment to retail stores. Most eggs reach supermarkets within 36 hours after they are laid, often without being touched by human hands.



## The Inside Facts

It's only natural that eggs are so popular because eggs are 100 percent natural. Take a look:

### Learning Outcomes:

- Connect concepts of form and function.

### Life Skills:

- Learning to learn

### SOLs:

English 4.1, 5.1, 5.2, 6.1

### Shell

- Outer covering of egg, composed of calcium carbonate.
- May be white or brown, depending on breed of chicken.
- Color does not affect quality, cooking characteristics, or nutritional value.

### Yolk

- Yellow portion of egg.
- Color varies with feed of the hen, but doesn't indicate nutritional content.
- Major source of vitamins, minerals and fat (The yolk contains more than 90 percent of the calcium, iron, phosphorus, zinc, thiamin, B<sub>6</sub>, folate, and B<sub>12</sub>, and 89 percent of the pantothenic acid [9 items]). The white does not contain more than 90 percent of any nutrient, but contains over 80 percent of the magnesium, sodium, and niacin).
- Germinal disc.

### Vitelline (Yolk) membrane

- Clean seal that holds egg yolk.

### Chalazae

- Twisted, cordlike strands of egg white.
- Anchor yolk in center of egg.
- Prominent chalazae indicate high quality.

### Air cell

- Pocket of air formed at the large end of the egg.
- Caused by contraction of contents during cooling after laying.
- Increases in size with age.

### Shell Membranes

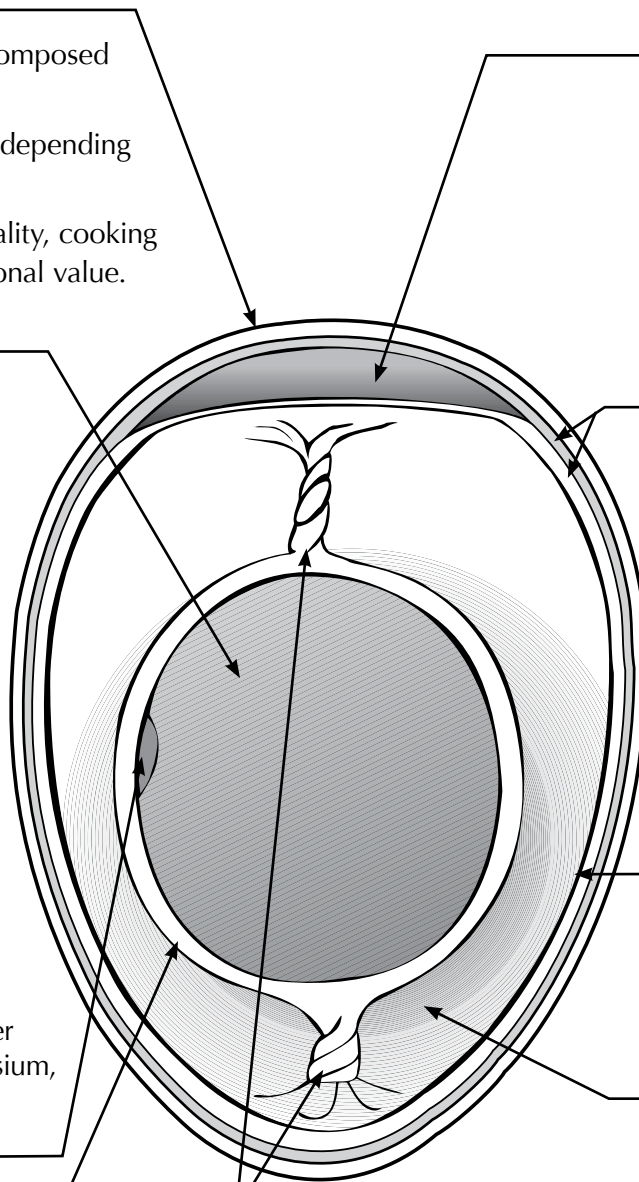
- Two membranes – inner and outer shell membranes – surround the albumen.
- Provide protective barrier against bacterial penetration.
- Air cell forms between these two membranes.

### Thin Albumen

- Nearest to the shell.
- Spreads around thick white of high quality egg.

### Thick albumen (White)

- Excellent source of riboflavin and protein.
- Stands higher and spreads less than thin white in high quality eggs.
- Thins and becomes indistinguishable from thin white in low quality eggs.



## Egg Color

Shell Color can be white, brown, or pastel shades as determined by the breed of the hen. It has no effect on quality, cooking properties, or nutritive value.

Yolk color is determined by the pigmentation in the feed fed to the hen and has no effect on cooking properties or nutritive value.

## Egg Trivia

One hen produces an average of 300 eggs a year. She begins laying at 20 weeks of age and continues to lay eggs for 12 to 15 months.

A lot goes into an egg. A hen must eat 3 1/2 pounds of feed to make a dozen large eggs (1 1/2 pounds). It takes a hen 24 to 25 hours to produce one egg.

To put the nation's yearly egg production (67 billion eggs) into proper perspective, eggs placed end-to-end would make five round trips from the earth to the moon and back again.

## Egg Nutrition

Eggs are the highest quality protein and are often used as a standard to measure protein in other foods. Protein is necessary to build and repair body tissues. Because of their protein content, eggs are classified in the Meat and Beans Group of the USDA's MyPyramid Food Guide ([www.mypyramid.gov](http://www.mypyramid.gov)). Two eggs are considered one serving of this food group.

Eggs are also high in Vitamins A, D, E, K, and B-complex and are rich in minerals, particularly iron. Plus, eggs contain the ideal balance of essential amino acids (the building blocks of proteins), which the body can't manufacture.

The yolk makes up just over one-third of the egg, and provides three-fourths of the calories, all of the fat and fat-soluble vitamins (A, D, E, K), and most of the choline, phosphorus, iron, and calcium. The egg white (albumen) comprises more than one-half of the total protein and riboflavin.

Even though eggs are considered a nutritional powerhouse, they are low in calories. One large egg has about 80 calories, 60 of which come from the yolk. Eggs are considered a dieter's delight! Because of their high nutritive content and easy

### Nutrition Information per Serving

Serving Size = 2 Large Eggs

(108 g edible portion)

Calories .....	160
Protein .....	13g
Carbohydrates .....	1g
Fat (Percent of Calories - 68%) .....	12g
Polyunsaturated .....	1g
Saturated .....	4g

### Percentage of U.S. Recommended

Daily Allowances (U.S. RDA)

Protein .....	30
Vitamin A .....	10
Vitamin C .....	*
Thiamin .....	6
Riboflavin .....	20
Niacin .....	*
Calcium .....	6
Iron .....	10
Vitamin D .....	15
Vitamin E .....	6
Vitamin B <sub>6</sub> .....	6
Folic Acid .....	15
Vitamin B <sub>12</sub> .....	15
Phosphorus .....	20
Iodine .....	35
Zinc .....	10
Biotin .....	8
Pantothenic Acid .....	15
Copper .....	4
Magnesium .....	3

\*Contains less than 2% of U.S. RDA of these nutrients.

digestibility, eggs belong in the diet at every age from infants (over 6 months) to the elderly.

### Cholesterol

Cholesterol is a complex, waxy molecule which is part of every cell. It is found in brain tissue, blood cells, blood plasma, bile, and other tissues.

Cholesterol is essential to the body. It acts as a conductor for the transmission of nerve impulses and helps carry fatty acids in the blood. It's required for the formation of bile acids necessary

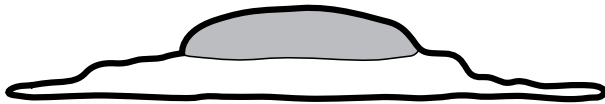
for digestion. Cholesterol must be present for the formation of various sex and adrenal hormones and for the synthesis of vitamin D from sunlight.

Since cholesterol is essential, the body assures steady supply by making it in most tissues except the brain. In fact, the body manufactures 800 to 1500 mg of cholesterol daily. One large egg contains about 260 mg cholesterol. A normal, healthy individual should eat a varied diet, control weight, and exercise regularly.

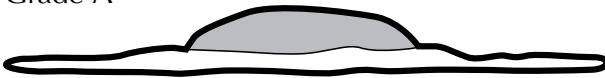
Individuals concerned about their blood cholesterol levels should consult with and follow the advice of their doctor. Doctors use serum (blood) tests for cholesterol and HDL/LDL (high/low density lipoproteins) as a measure of the body's ability to metabolize cholesterol. It is not necessary to restrict an individual's cholesterol level when serum cholesterol levels and HDL/LDL are within normal limits.

## Egg Quality

Grade AA



Grade A



Grade B



Today's consumer is concerned with two types of egg quality. First, interior quality of the egg determines how the egg will perform in meal preparation. Even though high quality eggs perform best in cooking, there is essentially no loss of nutrients in eggs of lower quality. Second, exterior egg quality is evaluated under United States Department of Agriculture grading specifications. Consumer egg grades are AA, A, and B.

A Grade AA egg with stand up tall. The yolk is firm and the area covered by the white is small. There is a large proportion of thick white to thin white. In some areas, these are called "Fresh Fancy."

A Grade A egg covers a relatively small area. The yolk is round and upstanding. The thick white is large in proportion to the thin white and stands fairly well around the yolk.

A Grade B egg spreads out more. The yolk is flattened and there is about as much (or more) thin white as thick white.

If not properly refrigerated, or if refrigerated for a lengthy period of time, eggs will lose carbon dioxide and water which causes them to spread out more when broken out. This natural aging process does not affect the nutritional quality of the eggs but may cause them to be classified as a lower grade. These eggs still perform well in scrambled or baked dishes.

## Choosing Egg Size

Select eggs by size. There is no relationship between the size and grade of eggs. Sizes of eggs range from Jumbo to Peewee. While one or two eggs in a dozen may be smaller or larger than the others, the weight of the entire carton of eggs is what counts. Size is expressed in ounces per dozen.

Jumbo

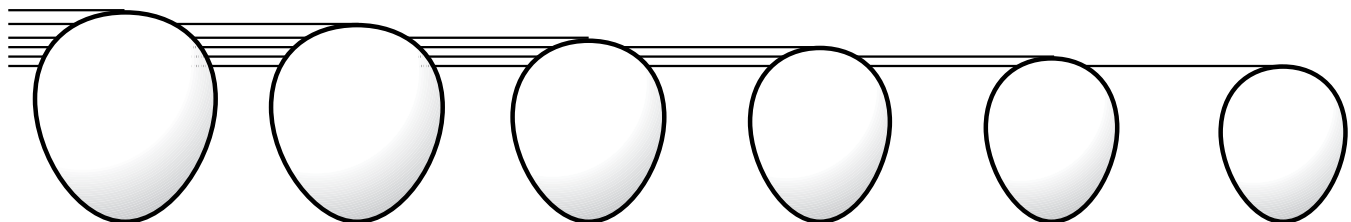
Extra Large

Large

Medium

Small

Peewee



Minimum wt.  
per dozen  
30 oz.

27 oz.

24 oz.

21 oz.

18 oz.

15 oz.



	Grade AA	Grade A	Grade B
Break Out Appearance	Covers a small area.	Covers a moderate area.	Covers a wide area.
Albumen Appearance	White is thick and cloudy, stands high, chalazae prominent.	White is reasonably thick, stands fairly high, chalazae prominent.	Small amount of thick white; chalazae small or absent.
Yolk Appearance	Yolk is firm and high.	Yolk is firm and stands fairly high.	Yolk is somewhat flattened and enlarged.
Shell Appearance	Shell unbroken, clean, but may have small stains that do not detract from general appearance, generally smooth but may have small rough spots that do not affect shape or strength.		Abnormal shape; some slightly stained areas permitted; unbroken; pronounced ridges, thin spots permitted.
Usage	Ideal for any use, but are especially desirable for poaching, drying, and cooking in shell.		Good for scrambling, baking and use as an ingredient in other foods.

## Eggonomics

Consumers often wonder which size eggs are the best buy. To help you in buying eggs, prices have been converted from a per-dozen-basis to a per-pound-basis. The conversion chart below will allow you to decide which egg size is the better buy.

Economically speaking, eggs are a good alternative for meat. Regardless of size, eggs are an excellent

buy when compared with one pound of meat, cheese, or other high-quality protein food. Eggs contain no bone and have little waste (only the shell) and no shrinkage during proper cooking.

For Example: Large eggs at \$1.45 a dozen cost 96 cents per pound while Jumbo eggs at \$1.86 a dozen cost \$1.00 per pound, therefore, large eggs are the better buy.

## Egg Prices Calculated by the Pound

Price Per Dozen					
Small (18oz.)	Medium (21 oz.)	Large (24 oz.)	X-Large (27 oz.)	Jumbo (30 oz.)	¢ /Lb (16 oz.)
0.79	0.92	1.05	1.18	1.31	0.70
0.825	0.96	1.10	1.24	1.375	0.73
0.86	1.005	1.15	1.29	1.44	0.765
0.90	1.05	1.20	1.35	1.50	0.80
0.94	1.09	1.25	1.405	1.561	0.80
0.98	1.13	1.30	1.46	1.62	0.865
1.02	1.18	1.35	1.52	1.68	0.90
1.05	1.22	1.40	1.57	1.75	0.93
1.09	1.26	1.45	1.63	1.81	0.965
1.13	1.31	1.50	1.69	1.86	1.00

Large Eggs	Jumbo	X-Large	Medium	Small	Peewee
1	1	1	1	1	2
2	2	2	2	3	3
3	2	3	3	4	5
4	3	4	5	5	6
5	4	4	6	7	8
6	5	5	7	8	10

### Substituting Sizes

Most recipes use large eggs. When other egg sizes are a better buy per pound, the above table can serve as a guide in substitutions.

### Know Where Eggs Are

Shell eggs kept at room temperature 70° to 80°F (21 to 27°C) lose more quality in one day than in one week under refrigeration. At refrigerator temperature, 40° to 51°F (4° to 10°C), eggs maintain their inherent high quality for four weeks or more.

Only fresh, clean, sound-shell eggs from refrigerated display cases should be purchased and refrigerated promptly. Since each eggshell has 6,000 to 8,000 tiny pores, always store eggs away from foods with strong odors such as onions, apples, cabbage, and potatoes. The carton holds eggs in the best position – large end up to keep the yolk centered.

As an egg loses quality, the following changes occur:

- The thick white becomes thin.
- The yolk breaks easily when the shell is opened
- Air cell size increases.
- The yolk may become off-center.
- The egg may absorb odors.

Proper storage and handling can minimize these changes.

If a recipe calls for only egg whites or egg yolks, save extra yolks or whites for later use and store them in a tightly closed container. Refrigerate for use up to three days. Yolks should be covered with water before refrigerating. Refrigerate hard-cooked eggs promptly. Hard-cooked eggs in the shell may be refrigerated for use up to five days.

### Freezing

Whites, yolks, and hard-cooked yolks can be successfully frozen. Hard-cooked whole eggs or hard-cooked whites will become tough if frozen. Eggs cannot be frozen in their shells.

To freeze egg whites, pour them into freezer containers, seal tightly, label with number of whites and the date, and freeze. Also, whites can be frozen in ice cube trays. Just transfer frozen cubes to a freezer container.

Yolks or whole eggs require special treatment before freezing. When frozen, the gelation property of the yolk causes it to thicken or gel. To help retard this gelation, add either 1/8 teaspoon salt or 1 1/2 teaspoons sugar or corn syrup for each four yolks or two whole eggs. Label containers with the number of yolks or whole eggs, and the date, and mark whether you've added salt (for use with main dishes) or sweetener (for baking or desserts). You may find that the finished product is somewhat thicker than it would be if made with fresh eggs.

Thaw frozen eggs overnight in the refrigerator or under running cold water. Use yolks or whole eggs as soon as they're thawed. Once thawed, whites will beat to better volume if allowed to sit at room temperature for about 30 minutes.

### Egg Safety

Due to their concentration of nutrients and high-quality protein, eggs like other foods are susceptible to bacterial growth. Clean, sound-shelled eggs are very resistant to bacterial spoilage.

Cracked or spoiled eggs may contain salmonella bacteria that can cause nonfatal food poisoning. Cooking foods to an internal temperature of 165°F will kill all salmonella. Some foods made with eggs present a unique problem because they are sometimes prepared and served only partially cooked. Some examples of these are:





- Soft meringues
- Cream pies, soft custards, puddings, chiffon pies
- Soft-cooked, poached, soft-fried, and soft-scrambled eggs and omelets
- Many egg-nogs and other milk and egg drinks

For foods of this type use only clean, uncracked Grade A or AA eggs. Soiled or cracked eggs should be used only if the food product is to be thoroughly cooked.

If eggs or egg dishes are not served immediately, hot foods should be kept above a temperature of 140°F and cold foods below 45°F. Eggs and egg dishes (including potato salad with eggs), cream pies, custards, custard-filled pastries such as *éclairs*, cream-puffs, dressings, stuffings, etc. should never be held at room temperature. If salmonella is present, it will grow rapidly at warm temperatures. Always refrigerate until served.

## Eggs Make It Better

### Egg Properties

The basic property of egg cookery is the ability of proteins in both the yolk and albumen to coagulate when heated. Eggs and egg mixtures should be cooked at moderate temperatures. High temperatures will result in unevenly cooked, rubbery egg dishes. Cooking properties of eggs are further explained below.

**Thickening:** Eggs thicken liquid mixtures like custards, puddings, pie fillings, and sauces. Two egg yolks can thicken the same as one whole egg. When heated, protein in the egg coagulates and the egg mixture thickens.

**Binding:** Eggs serve to hold several food ingredients together, such as in meat loaf or croquettes. Upon heating, protein coagulates, binding the food together to retain its shape.

**Coating:** As a coating on meats and vegetables, eggs can bind an outer breading to foods. As a wash on breads and pastries, eggs or egg yolks aid in browning and moisture retention.

**Leavening:** When egg white is beaten, a foam is formed by incorporating air into the whites. It helps leaven or give a light, airy quality to such products as soufflés, sponge cakes and puffy omelets. Beaten

whole eggs give a certain leavening quality to quick breads and butter cakes. Leavening makes foods lighter.

**Emulsifying:** Eggs have the unique ability to allow liquid fats, like butter or oil, to combine with other non-fatty foods to produce such mixtures as mayonnaise, salad dressings, and sauces.

**Clarifying:** The coagulating property of an egg causes absorption of tiny particles to make liquids clear or clarified, e.g. broth.

**Retarding Crystallization:** When making certain frostings and candy, eggs help retard, or slow down, the natural crystallization of sugar and prevent lumps.

**Garnishing:** Sliced or chopped hard-cooked eggs, or cooked and crumbled yolks help give a “finishing touch” to the appearance of canapés, soups, salads, and main dishes.

## Cooking Eggs

**Scrambled Eggs:** When the buttered skillet is hot enough to sizzle a drop of water (medium heat), pour in beaten eggs. As the mixture begins to set, gently move it with a spatula to form large moist egg curds. Eggs removed from the skillet while still moist will continue to cook after they are removed from the skillet.

**Fried Eggs:** Break eggs into a bowl, then slip them into a preheated skillet containing a small amount of butter. Avoid breaking the yolks. Turn heat down immediately after putting the eggs into the skillet and cook to the desired doneness.

**Eggs in the Shell:** Eggs cooked in the shell, either soft or hard-cooked, should not be boiled. High boiling temperature toughens and discolors eggs. Cover the eggs with cold water, cover saucepan, and bring to boiling. Turn the heat off. Leave large eggs in the hot water for 15 to 18 minutes for hard-cooked eggs. Immediately cool in cold water.

**Poached Eggs:** Break eggs into a small bowl and gently slip into simmering water for 3 to 5 minutes. Highest quality eggs should be used for poaching. When poached, the white is cooked but tender while the yolk is slightly set.

**Baked Eggs:** Break eggs into small, individually greased baking dishes. Bake in the oven at 325°F for 12 to 18 minutes.



Omelets: Beat 2 eggs with 2 tablespoons of water. Heat the skillet to medium-high, until it sizzles a drop of water. Add 1 teaspoon butter and pour egg mixture into the skillet.\* With a pancake turner, pull the cooked mixture to the center, tilting the pan to allow the uncooked egg to flow onto the skillet. Visualize the skillet as a clock and continue to move the egg mixture at 12, 3, 6, and 9 o'clock until all the liquid is set. While top is still moist and creamy looking, fill the left side of the omelet with filling ingredients of your choice. Slip a pancake turner halfway and fold the omelet in half. Invert onto the plate with a quick flip of the wrist.

*\*When holding the skillet, the handle should be towards your waist for ease of turning the omelet out of the pan. It also acts as a dividing line for fillings where it will be folded.*

## Break for Tips

- Break an eggshell with a sharp tap at the center with a knife blade. Press thumbs into cracks, turning crack down. Pull apart and let egg drop into bowl.
- If eggs are to be separated into yolks and whites, do so as soon as eggs are removed from the refrigerator. Cold yolks are less likely to break.
- To separate an egg, let each half of the shell serve as a cup to rock the yolk from cup to cup while white pours out. To remove bits of shell from an egg, use half of the shell as a scoop.
- When egg yolks are added to a hot mixture all at once, they may coagulate too rapidly and form lumps. Stir a small amount of the hot mixture into the yolks to warm them, then stir the warmed egg yolk mixture into the remaining hot mixture.
- Cream of tartar or sugar may be added to egg whites to increase the stability of the foam. However, when sugar is added too fast, it retards the foaming of egg whites. Fat also inhibits the foaming of egg whites.
- Has your meringue been beaten enough? Just rub a little of the meringue between your thumb and forefinger, if you feel grains of sugar, the meringue has not been beaten enough. Continue to beat until no grains of sugar are left.
- When topping a pie, put the meringue on while the filling is still hot. Bake meringue at 375°F until light and golden brown. This reduces the amount of liquid that collects between meringue and filling. Spread the meringue all the way to the pie crust, making sure the filling is completely sealed to prevent the meringue from shrinking. To prevent hard meringues from cracking after baking, turn off heat. Do not open oven door and leave in oven to cool several hours or overnight.
- Pans used for baking soufflés or foam-type cakes should not be greased or treated, so the mixture can climb the sides of the pan for greater height. However, jelly and cake roll pans are the exceptions, and should be lined with greased paper.
- It is better to remove eggs when they are slightly underdone. Heat retained in eggs completes the cooking.
- To help prevent the green discoloration that sometimes appears between the white and yolk of a hard-cooked egg, cook eggs at medium temperature, avoid overcooking and cool promptly. This is a reaction between iron and sulfur compounds in the egg.
- Very fresh eggs are hard to peel. Tip for easy-to-peel eggs: use one week old eggs or “age” very fresh eggs by leaving them at room temperature overnight before hard-cooking.
- How do you peel ultra-fresh eggs? As soon as eggs are cooked, place them in ice water for at least 1 minute. Then return eggs, one at a time, to the boiling water for exactly 10 seconds. The cold water shrinks the egg body away from the shell and the hot water causes the shell to expand away from the egg. Remove eggs, crack shells all over and begin peeling at the large end immediately.
- Hard to tell a hard-cooked egg from a raw one? A hard-cooked egg spins beautifully; a raw one wobbles as it spins.

