



NOVA SCOTIA DEPARTMENT OF AGRICULTURE

# Classroom Chick Hatch Program Manual

Updated March 2020





Agriculture in the Classroom PEI would like to acknowledge the Province of Nova Scotia for allowing us to use and promote this document and would like to thank the following for their contribution to this document.

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Classroom Chick Hatch Program Manual  
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# Classroom Chick Hatch Program Manual

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## Introduction

The hatching of chick eggs is an ideal opportunity to provide students with a valuable and memorable learning experience. For many students this will be their first exposure to farming. It also gives students an opportunity to observe the miracle of life.

Before undertaking this project, teachers are encouraged to read this manual and to discuss with their students that not all the eggs will hatch and that there is a possibility that a chick that does hatch may not be strong enough to survive. Even when the utmost of care is taken the chances of a one hundred percent hatch is unlikely.

Through this project students will have an opportunity to learn about the incubation process, embryonic development, practice animal care and handling, develop a greater appreciation and understanding of agriculture and specifically the poultry industry, and learn to perform specific skills such as reading a thermometer and candling an egg.

Remember, children learn best when involved in hands-on, real life experiences. The life cycle of the chicken is made real through the student's participation in this chick hatching program.

### Please visit:

[https://www.youtube.com/playlist?](https://www.youtube.com/playlist?list=PLwLZ9YtgHtLDNrQIsKxy8Hqwch53OQ04y)

[list=PLwLZ9YtgHtLDNrQIsKxy8Hqwch53OQ04y](https://www.youtube.com/playlist?list=PLwLZ9YtgHtLDNrQIsKxy8Hqwch53OQ04y) to view videos that were created specifically to enhance this program. The videos are designed to help both teachers and students with their hatch and to further explore egg and poultry production in Nova Scotia.

### For more information or additional resources, contact:

Agriculture in the Classroom PEI  
Ph: 902-892-1091  
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## Incubator Setup & Procedure

### Checklist

The following items should be included in your chick hatch kit. If any are missing or damaged, please notify the office where you obtained your kit.

- ☐ Incubator top and bottom
- ☐ Egg turner
- ☐ Wire or plastic rack
- ☐ Waterer top and bottom
- ☐ Feeder top and bottom
- ☐ Heat lamp with bulb (*plug in to ensure bulb does not need replacing*)
- ☐ Hand-held candler
- ☐ Chick Hatch Program Guidebook
- ☐ Incubation quick reference sheet
- ☐ Virkon tablets (disinfectant) in spray bottle
- ☐ Hatching eggs (*one dozen*)
- ☐ Feed (*chick starter*)
- ☐ Shavings for the brood box (hamster cage)
- ☐ Cheesecloth

### Incubating eggs

#### Prehatch

Before beginning the chick hatch project review the entire guidebook.

#### Incubator

The first step in the incubation process is to set up the incubator. The location of the incubator is important to the success of the hatch. The incubator should be placed in a location where room temperature is fairly constant; away from drafts, windows and radiators. The incubator should be set on a sturdy table where it will not receive bumps. Fill the shorter of the two moisture troughs in the incubator bottom with warm water. The incubator should run for at least one day to ensure the temperature remains stable before setting the eggs. If you need more detailed information on



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setting up the incubator, then refer to incubator setup direction sheet included at the back of this guidebook.

Instructions are also found in Video 1 – The Incubator

## Care of hatching eggs

Eggs should be placed in the incubator as soon as it reaches the required temperature of 99.5 F. If the eggs are to be held prior to incubation, then they should be stored in a cool damp place such as a basement or porch; **not in a refrigerator**. The optimal storage temperature is between 13–16°C (55–60°F). If the eggs are exposed to temperatures of 20°C (75°F) or higher then embryonic development will begin. More information regarding the care of eggs can be found in Video 2 – Hatching the eggs.

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*Remember, it is important to always wash your hands before and after handling the eggs.*

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## Incubation

There are four factors of major importance in the incubation of eggs: temperature, humidity, ventilation and turning. Of these factors, **temperature is the most critical**.

### Temperature

The ideal temperature for incubating eggs in a fan-forced incubator is 37.5°C (99.5°F). **Overheating in an incubator is more detrimental than under heating.**

Operating the incubator at 40°C (104°F) will seriously affect the embryos while operating it at 32°C (90°F) for a few hours will only slow the chick's metabolic rate.

When the eggs are first placed in the incubator the temperature will drop. Do not adjust the incubator temperature during the first 24 hours as it takes time for the eggs to warm up to the set temperature. Adjusting the temperature upwards on the first day has ruined hatches.

### Humidity

The relative humidity of the air within the incubator, for the first eighteen days, should be about 40% to 50%. Too little moisture in the incubator results in

excessive evaporation, causing chicks to stick to the shell at hatching time. Too much moisture in the incubator prevents normal evaporation and results in a decreased hatch. Excessive moisture is seldom a problem in small incubators.

By keeping water in the #1 moisture trough, the proper humidity should be maintained in the incubator. Whenever you add water to an incubator, it should be about the same temperature as the incubator so that it does not stress the eggs or the incubator. Add water which is warm to the touch. It is also important not to get the eggs wet when adding water. Water will probably need to be added to the shorter trough every few days.

If your classroom is dry and/or you are having difficulty managing the 40% to 50% humidity range, you can fill additional troughs as required (#2, #3, #4). Add water in gradual increments, so humidity raises slowly.

During the last three days (the hatching period) the relative humidity should be 50% to 60%. Increasing the humidity prevents the chick's beak from sticking to the shell and allows for freer movement of the chick's head at the time of pipping. **The relative humidity is increased by filling multiple moisture troughs on day 18.** It is the amount of surface water and not the depth of water that determines the humidity in the incubator.

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## In Case of Power Outage

*If you experience a power failure, do not scrap the hatch. The key is to keep the eggs as warm as possible until the power returns. This can be done by placing towels or a blanket on top of the incubator for additional insulation. Most of the time a power outage will only delay the hatch and may decrease the hatchability.*

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## Ventilation

Ventilation refers to the air movement within the incubator and air exchange with air outside the incubator. As the embryo grows, oxygen is taken up and carbon dioxide released through the pores in the eggshells. It is important to properly ventilate the incubator so that a buildup of carbon dioxide does not occur. To help control the exchange of air there are either one or two vent plugs in the top of the incubator. Three days after setting the eggs, remove one vent plug and leave it out for the remainder of the incubation.

During the hatching period (the last 3 days), if condensation appears on the incubator window, then remove the other vent plug, if there is two. If your incubator has one vent plug, you may have to remove some water. This is why water should be added gradually so humidity raises slowly. Be sure to replace the vent plugs before returning the incubator.

## Turning

Turning the eggs during the incubation period prevents the developing chick from sticking to the shell membrane.

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*Washing hands prior to handling the eggs will help keep microbes and dirt from entering the pores in the eggshell that allow respiration.*

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If your incubator is equipped with an automatic turner you should mark or number your eggs. This will allow you to see that the turner is working. Each day you should see the markings moving. If the markings are not moving daily, you will have to remove the automatic turner and turn the eggs manually.  
**Remember to remove the automatic turner on day 18.**

If your incubator does not have an automatic turner, you will have to turn them manually. The eggs should be turned at least twice daily starting on

day 2 and continuing until day 18. Do not turn the eggs during the last three days of incubation. In a classroom situation it may be difficult to turn the eggs on weekends. Every effort should be made to come in and turn the eggs at least once a day during weekends. Also remember to use care when turning the eggs as rough handling can rupture blood vessels.

To ensure proper turning, the eggs should be marked with a pencil. Pens and markers are not recommended as ink can be absorbed into the egg. Eggs may be marked with an "x" on one side and an "o" on the opposite side. Alternatively, numbering the eggs gives them individuality and adds excitement when candling and during hatch time. It does not matter which system you choose as long as you mark the eggs. When the eggs are turned all the "x's" or writing will be on the bottom or out of sight. At the next turning, the markings will be in view, and so on.

## **From the 18th day on, do not turn or handle the eggs.**

Do not move or open the incubator until the chicks have hatched. When turning the eggs for the last time, place a layer of cheesecloth on the screen under the eggs. This will make cleaning the incubator easier after hatching.

## Candling

Incubated eggs are candled to determine whether they are fertile and, if fertile, to check the growth and development of the embryo. Included in the chick hatch kit is a small handheld candler. Candling works best when done in a darkened room with curtains drawn and lights off. The darker the room the better. Candling is not a specific art, rather it is a comparison of eggs at the same stage. Brown eggs, because of the colour of their shell, are more difficult to candle than white eggs. Even so, students will be able to determine if eggs are fertilized and observe the developing embryo.

Placing the larger end of the egg on the candler will allow you to observe the air cell. The darkest area in the egg will be the developing embryo. If the light shines through the egg (egg is clear) then it is an infertile egg and should be removed. Eggs may be candled from day 5 to day 17. Candling eggs several times during the incubation is an excellent way to observe the embryo's growth.

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With each successive candling the students will see the embryo occupying more space in the egg as it approaches hatch day. Candling eggs will not harm them if they are handled gently. Do not keep the eggs out of the incubator for too long. Return them to the incubator as soon as the candling is complete.

For more information on candling please watch Video 4 – Egg Candling

## After the chicks hatch

Chicks should not be moved from the incubator to the brooder until they are dry and fluffy (usually a few hours following hatch). Students may handle the chicks once they are dry. Remember it takes a lot of effort for the chick to get out of its shell, so it will be tired and will need rest. Do not be alarmed if the chicks are not very active this first day.

A simple brooding unit may be used to keep a few chicks for a short period of time (3- 5 days). A large cardboard box or container may be used as a brooder. Provide feed and water to the chicks as soon as they are moved from the incubator to the brooder. It is a good idea to dip the chick's beak in the feed and water.

The shavings in the brooder serves as insulation and as an absorptive material. Shavings, sawdust, straw or sand may be used. Do not use newspaper or kitty litter. Never place chicks on a smooth surface, because they cannot grip a slippery surface, their toes will curl, and their legs will spread out to the side. This may result in permanent leg damage.

A suspended heat source should be provided to maintain the proper temperature for brooding chicks. The temperature under the light should be about 28°C (82°F). To determine if the chicks are at the proper temperature: if the chicks are moving to the

outer edges of the brooder box (away from the heat source) then the light should be raised as it is too hot; if the chicks are huddled together directly under the light, they are cold, so the light should be lowered. Comfortable chicks are usually distributed evenly throughout the brooder.

Remember, all domestic animals depend on humans for survival. Make sure the chicks are properly housed, kept warm and out of drafts, and have plenty of food and fresh water. This means checking the brooder first thing in the morning, at noon, and at the end of the day.

For more information please watch Video 3 – Chick Care

## When the project is over, chick pick up

Sanitize the incubator at the end of the project. The incubator bottom, liner, and wire floor rack should be washed with hot soapy water after use. Sanitizing sooner than later, after the chicks have been moved to the brooder, make the incubator easier to clean.

After rinsing with clean water, the incubator bottom, liner and rack should be sprayed with 10 percent bleach solution. Cover with the top of the incubator and allow to soak for one hour. Rinse the bottom, liner and rack with clean water and allow to dry thoroughly. Once dry, pack in box. Wash and dry waterer and feeder.

Review the checklist (page 2) to ensure all materials are accounted for and return.



## Incubation Troubleshooting

Observations	Probable Cause
Chicks hatching early	Incubator temperature is too high
Draggy hatch: some chicks early but slow in finishing	Incubator temperature is too high
Delayed hatch: eggs not pipping until 21st day or later	Incubator temperature is too low
Short down on chicks	High temperature or low humidity
Small chicks	Low humidity or eggs produced in hot weather
Large staggering chicks	High humidity
Shell sticks to chick	Low humidity at hatching time
Chicks smeared with egg contents	Low average temperature; high humidity
Soft chicks	Unsanitary incubator or temperature too low between days 1–19 or humidity too high 20–21 days
Rough navels	High temperature, low humidity or temperature variations.
Crippled or deformed chicks	Mostly chance. Poor nutrition of parent stock or heredity.
Albumen is left in the egg	Humidity too high, eggs not turned often enough, temperature too high
If chick starts to pip egg but is unable to get out	Low vitality or improper position; eggs not turned; temperature too high day 20–21
If embryo dies in shell	Low vitality, malnutrition or poor environmental conditions of parent stock; insufficient turning; unsanitary conditions
Large number of clear eggs	Infertile eggs or very early embryonic mortality

## Frequently Asked Questions

- Can I hatch eggs from the store?**  
 No, the eggs bought at the store are not fertilized and only fertilized eggs will hatch.
- Where were the fertilized eggs obtained?**  
 The fertilized eggs were bought at a hatchery or from a farm that has both hens and roosters.
- Where should eggs be stored, if they cannot be set right away?**  
 If the eggs cannot be put in an incubator immediately, then they should be kept, small-end down, in a cool room at a temperature between 13 and 16°C (55–60°F). **DO NOT PUT THE EGGS IN A REFRIGERATOR!**
- What is the maximum length of time eggs can be held before incubating?**  
 No more than 2–3 days.
- What temperature is required to hatch eggs?**  
 The circulated air incubator should run at a temperature of 37.5°C (99.5°F).
- Why is it important to wash hands before handling the eggs?**  
 Microbes, perspiration from the hands or any sort of grease is injurious, because it clogs up the pores of the shell.

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**7. Why is it important to turn the eggs?**

The eggs are turned to prevent the embryo from sticking to the shell membrane and is similar to what the mother hen does when she sets.

**8. How often should the eggs be turned?**

The eggs should be turned at least twice daily or use a mechanical turner inside the incubator.

**9. When do we stop turning the eggs?**

Stop turning the eggs on day 18.

**10. What happens if the eggs are not turned?**

If the eggs are not turned the embryo will die about day 11.

**11. What should I use to mark the eggs?**

A lead pencil. Do not use a pen or marker.

**12. Why is water added to the incubator?**

Water is needed to maintain proper relative humidity in the incubator. If the relative humidity is too low, then the chick will stick to the shell membrane and death will occur. Humidity should be between 40%-50% for setting (day 1-18) and 50%-60% for hatching (day 19-21)

**13. How can I be sure that I have enough humidity?**

If the appropriate troughs are kept full of water, then the correct humidity should be maintained. You can fill additional water troughs, if your classroom is very dry – to maintain the humidity in the desired range.

**14. How can I tell if I have too much humidity?**

There will be a great deal of condensation on the inside of the incubator window.

**15. How do I add the water?**

Add warm water with a squeeze bottle or cup being careful not to get the eggs wet.

**16. What is candling?**

Candling involves shining a bright light through the egg (in a darkened room) to determine egg quality, if the egg is fertile and to check embryonic development.

**17. When should the eggs be candled?**

Eggs may be candled anytime between day 5 of incubation through to day 17.

**18. How long should the eggs be kept out of the incubator?**

No more than 5 to 10 minutes at a time.

**19. What should I do if I find a clear egg?**

A clear egg will not hatch and should be removed from the incubator and disposed of.

**20. What if there is a power outage?**

You should place a blanket or towels over the incubator to help insulate it. If the power outage is going to last more than 12 hours, then you should make arrangements to move the incubator to a location with power.

**21. How long does it take for the eggs to hatch?**

Normal hatch time for chicken eggs is 21 days.

**22. How long should I leave the eggs in the incubator if they do not hatch on the twenty-first day?**

Leave the unhatched eggs until the twenty-third or twenty-fourth day. If they still have not hatched, then dispose of them.

**23. Will all the eggs hatch?**

In most hatches there will be a few eggs that will not hatch even though you have followed the directions; this is just a fact of nature.

**24. Should I help the chick out of the shell?**

This is not recommended and is often painful for the chick.

**25. Can we hold the chicks as soon as they hatch?**

The chicks should not be handled until they are completely dry and fluffed up. After they are dry, they may be handled but remember to be gentle.

**26. What is a brooder box?**

A brooder box is a temporary home for baby chicks up to one week of age. It contains bedding, feed, water and a heat source suspended above the container.

**27. When should I move the chicks to the brooder box?**

The chicks should be moved once they are dry, usually within 24 hours of hatching.

**28. When do the chicks need water?**

The chicks need to drink water when they are moved to the brooder.

**29. When do the chicks need food?**

The chicks should have food the first day but can survive for up to three days after hatching.

**30. Do I need to teach the chicks to eat and drink?**

Yes, it is a good idea to dip the chick's beak in the water and feed so that they know where it is.

**31. What do the chicks eat?**

They need chick starter which is comprised of various grains, vitamins and minerals.

**32. What should be used for bedding in the brooder box?**

You can use wood shavings, chopped straw, sawdust or sand. Do not use cat litter or newspaper.

**33. What temperature should the brooder box be?**

Brooding temperature will vary with conditions however, a temperature of 28°C (82°F) is recommended. The chicks themselves are the best indicator of correct temperature. If the chicks are at the edges of the brooder then they are too hot, and the temperature needs to be lowered. If the chicks are huddled under the heat source, then they are cold, and the temperature needs to be raised.

**34. How do I adjust the temperature in the brooder box?**

By lowering the heat source, you will increase the temperature and by raising it you will lower the temperature.

**35. How can you tell a hen from a rooster?**

It is difficult to tell at hatch unless they are a strain that can be feather sexed.

**36. How do you feather sex?**

In feather sexing the female wing feathers are longer than the male wing feathers at 3–4 days of age.

**37. How long do chickens live?**

Broilers reach market weight at 6–8 weeks. On most commercial egg farms laying hens are usually kept for 18–20 months. Records show that when allowed to live out their lives naturally they can live for 6–10 years.

**38. Can I take one of the chicks home?**

No, chicks cannot go home with students as they do not have the proper facilities for raising chickens. The chicks must go to a farm to live.

**39. Do chickens make good pets?**

No, baby chicks grow very quickly into large chickens with sharp claws and are unable to be house broken.

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## Recommended reading

### The reproductive system and fertilization

#### The Hen

The reproductive system in the female chicken is in two parts: the ovary and the oviduct. Unlike most female animals, which have two functioning ovaries, the chicken usually has only one. The right ovary stops developing when the female chick hatches, but the left one continues to mature.

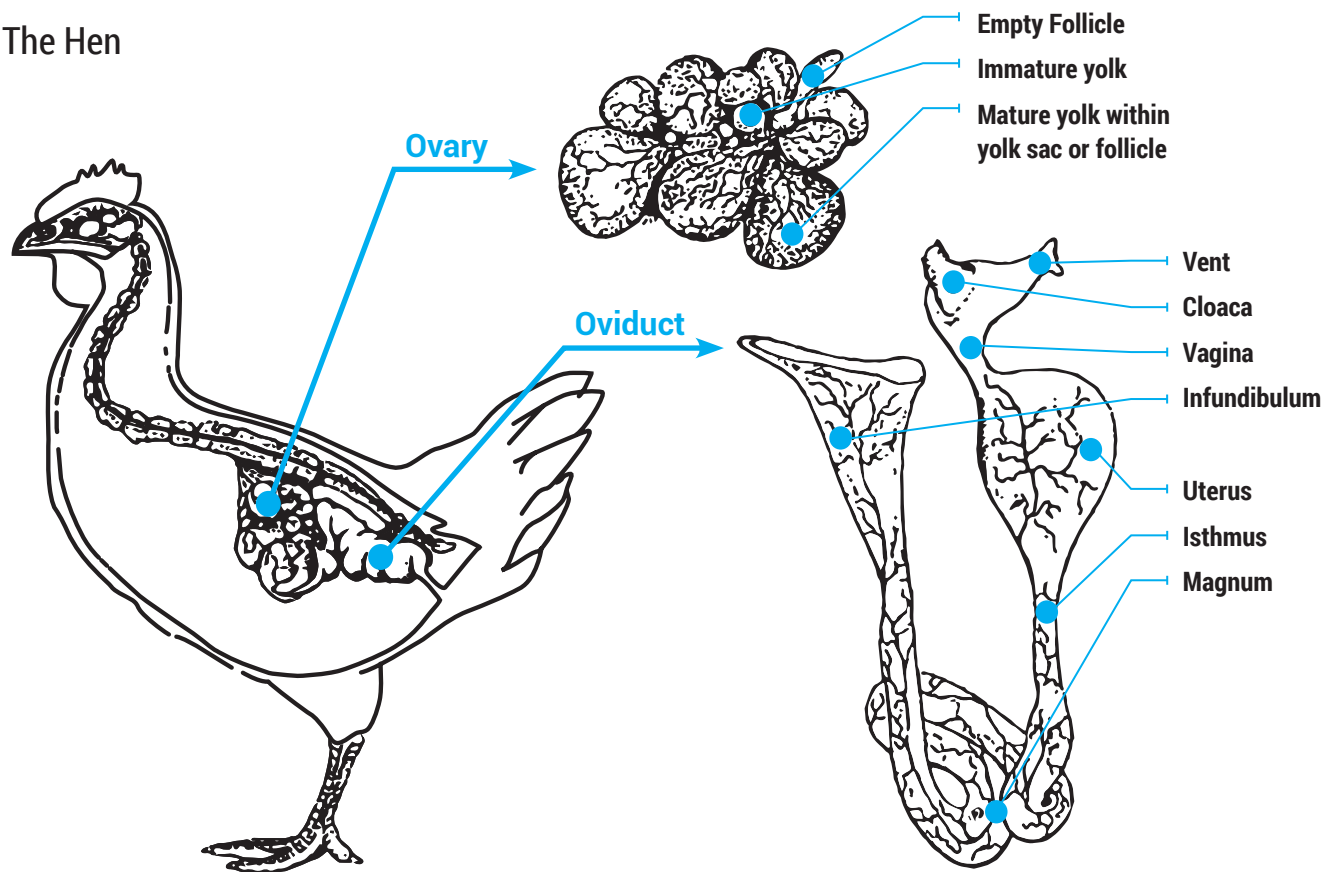
#### Ovary

The ovary is a cluster of developing yolks, attached to the back about midway between the neck and the tail. It is fully formed when the chicken hatches and contains several thousand tiny ova, each ovum within its own follicle. As the female matures, these ova develop a few at a time into yolk.

#### Oviduct

The oviduct is a tube-like organ lying along the backbone between the ovary and the tail. In a mature hen, it is approximately 63-69 cm (25-27 inches) long. The yolk is completely formed in the ovary. When a yolk is fully developed, its follicle ruptures, releasing it from the ovary. It then enters the infundibulum or entrance of the oviduct. All other parts of the egg are added to the yolk as it passes through the oviduct. The chalazae, albumen, shell membrane, and shell are formed around the yolk to make the complete egg, which is then laid. This complete cycle usually requires a little more than 24 hours. About 30 minutes after the egg is laid, another yolk is released and the process repeats itself. The ovary and parts of the oviduct are shown below.

#### The Hen



## The Rooster

The male fowl has two testes which are situated high up in the abdominal cavity, along the back. These never descend into an external scrotum, as in the case with other animals. They produce semen, the liquid vehicle for the sperm.

### Testis

The testis consists of a large number of very slender, much-convoluted ducts, from the linings of which the sperm are given off. These ducts appear in groups separated by delicate membranes which extend inward from a membrane surrounding the testis. They all lead eventually to the vas deferens, a tube that stores the semen and conducts it from the testis to a papilla.

### Papilla

Each deferent duct opens into a small papilla, and together the papilla serves as an intromittent organ. They are located on the dorsal wall of the cloaca.

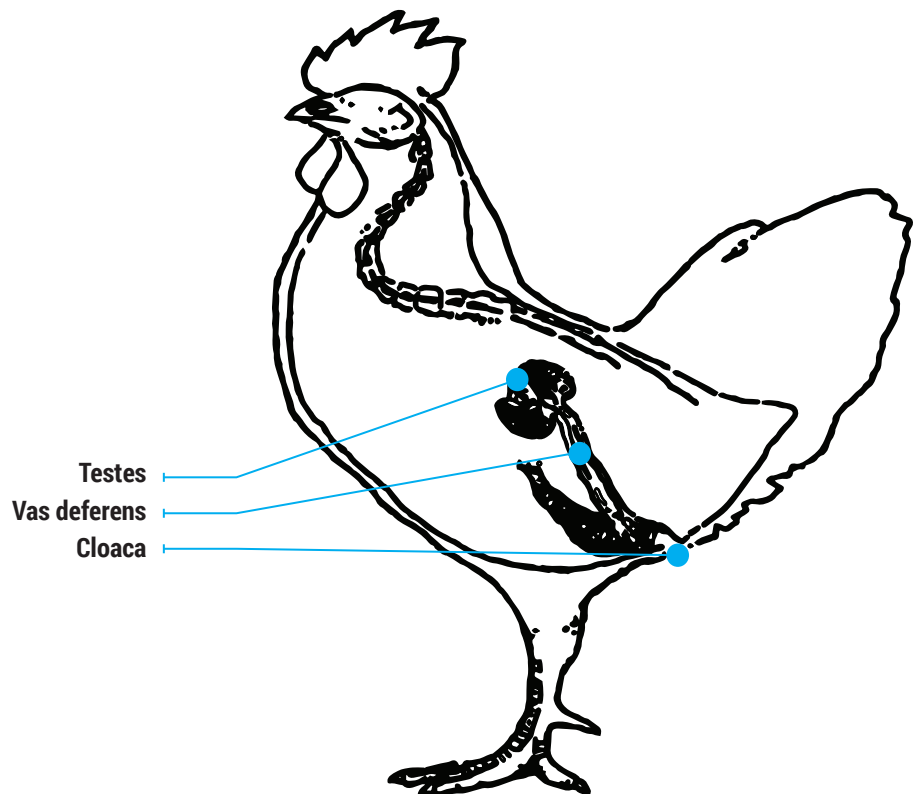
## Fertilization

When a rooster mates with a hen, it deposits spermatozoa in the oviduct. These sperm, travel the length of the oviduct and are stored in the infundibulum.

On the surface of every yolk is a tiny, whitish spot called the blastodisc. This contains a single female cell. When a yolk enters the infundibulum, a sperm penetrates the blastodisc, fertilizing it. The blastodisc becomes a blastoderm. Shortly after fertilization, the blastoderm begins to divide into 2, 4, 8, or more cells. The first stages of embryonic development have begun and continue until the egg is laid. Development then subsides until the egg is incubated.

The hen will continue to lay eggs even if she is not fertilized by the rooster. This is comparable with the unfertilized mammal which continues to ovulate but does not become pregnant, unless first fertilized by a male.

## The Rooster





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## The avian egg and its parts

The word egg to most people, means a versatile and nutritious food. The chicken egg is actually a very complex structure designed to nourish and protect the growing chick embryo. Although human nutritional requirements are not the same as those of the chick, they are similar in so many respects that the egg has become a convenient, economical source of many of the essential proteins, vitamins and minerals necessary to our good health.

Looking at the egg from the outside we see the shell which is the first line of defense against bacteria. The shell is a hard protective covering composed primarily of calcium carbonate. The shell is porous, containing approximately 8,000 to 10,000 tiny pores. The pores allow for the transfer of gases and moisture in and out of the egg.

Immediately beneath the shell are two membranes, the outer and inner shell membranes. These membranes are composed of thin layers of protein fibers. They are the second line of defense against bacteria and prevent liquid from evaporating too rapidly from inside the egg.

The shell membranes surround and contain the albumen or white of the egg. The albumen, which is

comprised mainly of water and high-quality proteins, provides the liquid medium in which the embryo grows and the protein necessary for proper development.

The albumen surrounds the yolk of the egg. The yolk is the egg's major source of vitamins, minerals, essential fatty acids, carbohydrates and protein. These nutrients provide an abundant source of metabolic energy for the embryo. The yolk is contained by the vitelline membrane.

The germinal disc (or blastodisc) appears as a slight depression on the surface of the yolk. It is the entry point for the fertilization of the egg.

In a fresh egg, you can see two white cords attached to the yolk. These two cords, called chalazae, are made of twisted strands of mucin fiber, a special form of protein. The role of the chalazae are to anchor the yolk in the center of the egg. Chalazae are not noticeable when the egg is cooked. After being laid, the contents of the egg cool and contract. This creates a vacuum and air is drawn into the egg through the pores at the large end of the egg, forming an air space between the shell and the outer membrane. The fresher the egg the smaller the air cell. The air cell acts as a tiny shock absorber during early development of the embryo.

## The timing of major embryonic developments

### Before egg laying

1. Fertilization.
2. Division and growth of living cells.
3. Segregation of cells into groups of special function.

### Between laying and incubation

No growth: stage of inactive embryonic life.

**Day 1:** Several embryonic processes are in evidence during the first 24 hours of incubation.

- 4 hours: Heart and blood vessels start to develop.
- 12 hours: Heart starts to beat.
- 16 hours: First sign of resemblance to a chick embryo.
- 18 hours: Appearance of alimentary tract.
- 20 hours: Appearance of the vertebral column.
- 21 hours: Origin of the nervous system.
- 22 hours: Head begins to form.
- 24 hours: Begin formation of the eye.

**Day 2:** Beginning of the formation of the ear.

**Day 3**

- 60 hours: Begin formation of the nose.
- 62 hours: The legs begin their development.
- 64 hours: Begin formation of the wings.
- 70 hours: Begin formation of allantois. Amnion completely surrounds embryo.

**Day 4:** Formation of tongue begins. Embryo completely separate from yolk sac and turned on left side.

**Day 5:** Formation of reproductive organs and sex determined. Proventriculus and gizzard formed.

**Day 6:** Formation of beak and egg-tooth begins. Some voluntary movement of the embryo begins.

**Day 7:** The body begins rapid development and body organs are visible.

**Day 8:** Formation of feathers begins.

**Day 9:** Embryo begins to look bird-like.

**Day 10:** The beak begins to harden. Toes, as well as scales on the legs, start to appear.

**Day 11:** The walls of the abdomen appear.

**Day 12:** Toes fully formed.

**Day 13:** Scales and claws appear. Chick is covered with down.

**Day 14:** Embryo turns itself towards the blunt end of the egg.

**Day 15:** Small intestines taken into body.

**Day 16:** Scales, claws and beak becoming firm and horny. Albumen nearly gone and yolk becoming more important as a nutrient.

**Day 17:** Beak turns toward air cell.

**Day 18:** Growth of embryo nearly complete.

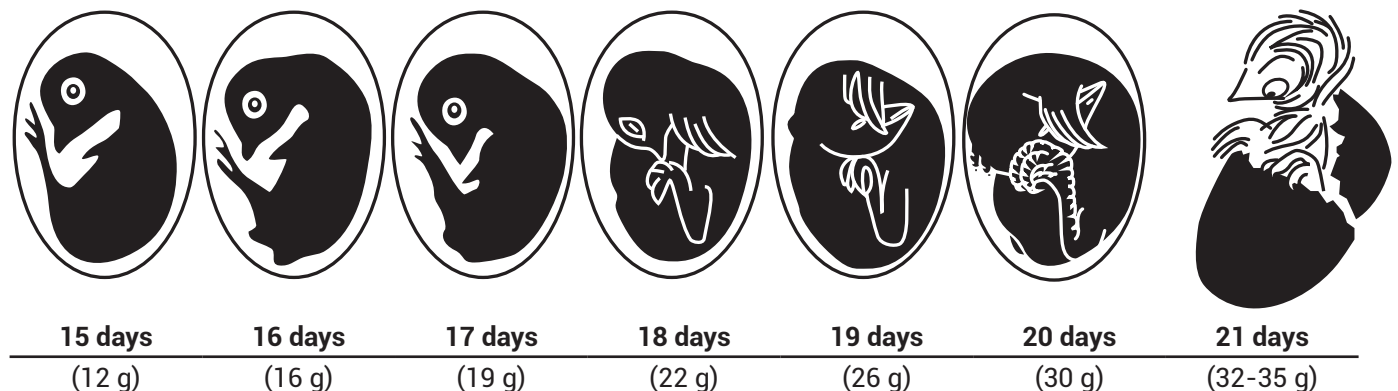
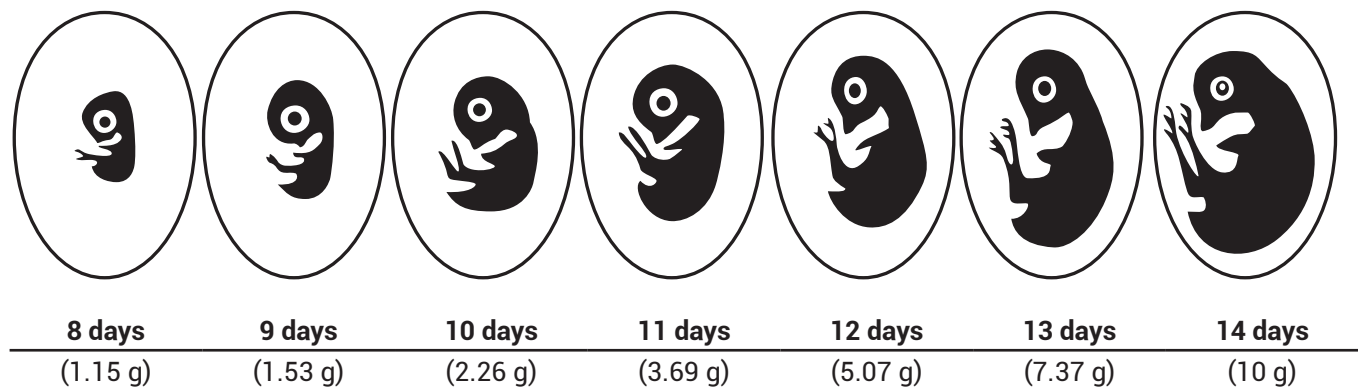
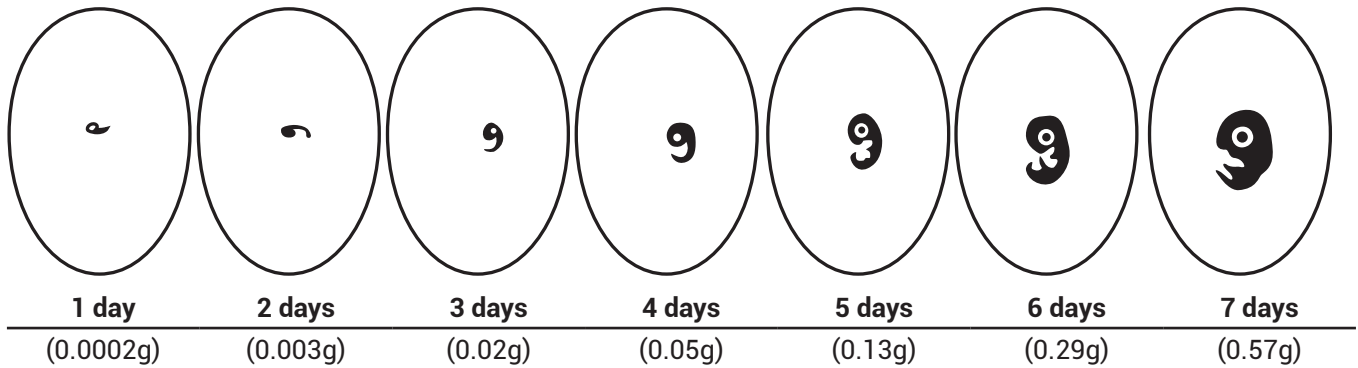
**Day 19:** Yolk sac begins to enter the body cavity. Embryo occupies most of the space within egg except for the air cell.

**Day 20:** Yolk sac has completed its entrance into the body cavity. Embryo becomes chick, breaks amnion, starts breathing air in air cell.

**Day 21:** Hatching of chick.

# Classroom Chick Hatch Program Manual

## Daily changes in weight and form of developing chick embryo



# Nova Scotia Poultry Industry

## Egg production

Licensed egg producers are located in most regions of the province. Farm sizes range from 500 to over 100,000 laying hens. Hens begin laying at about 19 weeks of age and continue for about 12 months. On average, a hen lays about 300 eggs during that period. In total, over 20 million dozen eggs are produced in Nova Scotia annually by licensed egg farmers. The provincial farm-gate value of eggs is approximately \$40 million.

### How are eggs produced?

In Canada, egg farmers use a variety of different systems to house their hens. Each system provides a clean environment, access to fresh food and water, and protection from natural predators. Most hens are housed in temperature- controlled barns because the Canadian climate is so variable. This allows farmers to keep a consistent temperature and humidity in the barn, and protects the hens from inclement weather like rain, snow, heat and humidity.

In conventional systems, hens are housed in small group settings with plenty of access to food and water. Enriched systems are equipped with perches and a curtained off area where the hens lay their eggs. In free run systems, hens roam the entire barn floor. Some of these barns are also equipped with multi-tiered aviaries. Similar to free run systems, in free range systems hens also roam the barn floor, and when weather permits they go outside.

Laying hens are fed a diet of grains, proteins, vitamins, and minerals. The hens' diet never contains hormones or steroids, the use of each being illegal in Canada for over 40 years!

Eggs are usually collected twice a day and are stored in a temperature and humidity-controlled cooler on the farm until they are sent to a registered egg grading station. Here, eggs are washed, sanitized and candled. The eggs are graded according to shell

and interior quality and sized according to weight. All eggs sold in retail stores must have been graded at a registered grading station. No matter where you shop in Nova Scotia, high-quality, locally produced eggs are always available.

### How are eggs used?

Eggs are extremely versatile and can be prepared in a variety of ways. They can be served with any meal, breakfast, lunch, and dinner, and are often a key ingredient in baking. Eggs are an excellent source of protein and provide essential nutrients to fuel your body.

Processed eggs are pasteurized before being further processed and packaged in liquid, frozen, or dried form and are used in manufacturing many foods, such as mayonnaise, noodles, and baked goods. They are also used to make non- food items, including pharmaceuticals, shampoo, pet foods, and adhesives.

## Chicken production

There are more than 85 registered chicken farmers in Nova Scotia, and they produce more than 55 million kg of chicken each year generating over \$70 million in farm-gate sales annually. Kings County chicken farmers produce approximately 80% of the provincial output while Lunenburg, Antigonish, Cumberland and Annapolis Counties produce the remaining 20% of commercial production.

### How are chickens produced?

Eggs are collected from broiler breeder operations and taken to hatcheries. At the hatchery, the eggs are placed in large incubators which have regulated temperature and humidity controls. The chicks are vaccinated at the hatchery to prevent illness. Within twenty-four hours of hatching, the chicks are transported to chicken farms in heated trucks. All Nova Scotia chicken farmers grow a mixed flock of female and male birds. There are three hatcheries in Nova Scotia.

At the chicken farm, barns are thoroughly cleaned and disinfected to prevent disease and keep the new flock healthy. These barns are specially designed to ensure

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that proper temperature, humidity and air quality are maintained.

Clean, chopped straw or wood shavings are spread on the barn floor. Broiler chickens are not kept in cages but are free-run. All commercial chicken farmers are required to maintain animal care and on-farm food safety programs on their farm.

To ensure nutritional requirements are met, Nova Scotia chickens are fed a diet of grains, soybean meal and canola meal, fats, vitamins and minerals. A clean, fresh supply of water is also an important element of a chicken's diet.

## **What happens after chickens leave the farm?**

When the chickens reach market weight of 2 to 3 kg (approximately 37 days) they are transported to a processing plant in trucks specially designed for shipping live poultry. At the plants, inspectors check the chicken to ensure the birds are healthy and safe for us to eat. Chicken products are then shipped to grocery stores, restaurants, or factories for further processing.

## **How is chicken used?**

Chicken meat is sold either fresh or frozen, and birds are sold whole or halved or cut into pieces and sold in packages containing breasts, thighs, drumsticks, or wings. These may be sold whole, skinless, or skinless and boneless. Chicken can be prepared in a variety of ways, usually baked, fried, roasted, broiled, or grilled. It is of course also processed further, by manufacturers of such products as precooked chicken pieces, soups, bouillon, stews, and pies.

## **Turkey production**

Nova Scotia has about 20 registered turkey farms producing in excess of 4 million live kg of turkey. Kings County has the most turkey producers, followed by Annapolis, Lunenburg, and Antigonish counties.

## **How are turkeys produced?**

Commercial breeders in Ontario and Quebec use artificial insemination (AI) to fertilize eggs. The eggs are collected and incubated for 28 days. Once hatched,

day-old poults are shipped to farms in temperature-controlled trucks. All turkeys are grown in large, modern poultry barns that are heated and ventilated to provide the proper temperature, humidity, and air circulation and wood shavings on the floor.

There are two stages to a turkey's production cycle. The brooding stage lasts from day-old to four to six weeks where the barn temperature is gradually reduced from 35°C to 21°C. The growth stage is from 6 weeks to market age, which varies depending on the desired market size. Depending on the breed, most hens reach market weight of 5.9 to 8.7 kg in about 11 to 15 weeks. Note: Toms are not grown in Nova Scotia.

Turkeys require about 2.3 kg of feed per kilogram of weight gain. The diet consists of mixed grains and oilseeds, which typically include corn, soya, wheat, barley, and canola. Turkeys are not fed hormones or steroids and are fed non-medicated feed before going to market.

## **What happens after turkeys leave the farm?**

When turkeys are ready for market, they are trucked to a primary processing plant. Once processed, they are packaged as whole birds. Food inspectors check each bird that moves through the processing plant to ensure it is safe for human consumption. The whole birds are then sent to retail outlets, institutions, hotels, and restaurants.

## **How are turkeys used?**

Turkey is not only consumed as a seasonal favorite at Easter, Thanksgiving, and Christmas, but year-round for everyday meals. Turkey is now processed into products such as fresh-cut segments and ground meat, as well as conveniently packaged frozen products. These products have resulted in a more even distribution of demand for turkey throughout the year. As well, health conscious consumers value turkey meat for its high-quality protein that is low in cholesterol and fat. Note: Only whole birds are processed and shipped in Nova Scotia.



## Poultry Trivia

- The average meat chicken consumes approximately 1.8 to 2.0 kg of feed to gain 1 kg of weight.
- Laying hens will start to lay eggs at about 19 weeks of age.
- Chicks normally come out of the big end of the egg. If they come out the small end, the hatching of the chick may be difficult or unsuccessful.
- Did you know that turkey and duck eggs take 28 days to hatch while chickens hatch in 21 days?
- According to a research study at Iowa State University a sitting hen will “turn” (shift) her eggs an average of 96 times in 24 hours.
- There is no nutritional difference between brown and white eggs. The color of the eggshell depends on the breed of the hen. White hens produce white eggs and brown hens produce brown eggs.
- The use of hormones and steroids in poultry is not legal in Canada.
- Table eggs are candled to determine the air cell, yolk and white; to detect blood spots, or meat spots.
- All chickens in Nova Scotia are grain fed, usually a blend of wheat, corn, barley and soybean meal, vitamins and minerals.
- Most hens lay an egg every 23–26 hours.
- A maple leaf, with an A in the center, means the egg product is Canada grade A.
- Nova Scotia Chicken can be found in grocery stores under the Raised by a Canadian Farmer Branding Program.
- A mature male chicken is called a rooster; a mature female, a hen. A cockerel is a male chicken under one year of age, while a pullet is a female chicken of that age. Baby chickens receive the diminutive, chicks.
- A broiler is a young chicken bred for meat, usually weighing between 1.7 and 2.5 kg. It takes 35 to 40 days for the bird to reach this weight.
- Chickens do not have teeth to chew their feed. They use an organ, called a gizzard, to grind food into smaller particles for digestion.
- No hormones or steroids are used in the production of chicken or eggs in Nova Scotia. In fact, the use of hormones in poultry feed has not been allowed in Canada since the 1970s.
- The most common laying hen in Nova Scotia is the White Leghorn, which lays white eggs. Rhode Island Red hens produce brown eggs, and the province of Nova Scotia has one of the highest percentages of brown egg production in Canada. However, the colour of the shell does not affect the nutritional value of the egg.
- Hens begin laying at about 19 weeks of age and continue for about 12 months. On average, a hen lays about 300 eggs during that period.
- Egg farmers and their families take great pride in providing a range of choice to consumers, including classic brown and white eggs, enriched, free run, free range, organic, Omega-3. No matter which type you choose, Nova Scotia eggs are always fresh, high-quality, Grade A eggs.
- Approximately 30% of Nova Scotia's total egg production is shipped to the processing market.
- Male turkeys are called toms; females, hens and broilers; and the young, poults (hatch to 15 days).
- A snood is a distinctive fleshy growth that hangs down over the beak of a turkey. Both toms and hens have the growth, but the snood of toms is larger than that of hens.
- A wattle is a fleshy part on the throat of the turkey. It is used in warm environments to dispel excess body heat.

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## Glossary

**Air cell-** The air space between the two shell membranes, usually at the large end of the egg, that can be easily seen when the egg is candled.

**Albumen-** The white of an egg, consisting of outer thin, and chalaziferous layers.

**Allantois-** An embryonic membrane which, in birds, serves as a respiratory organ and a reservoir for waste and facilitates the absorption of albumen and calcium.

**Amnion-** A transparent sac, filled with colourless fluid, surrounding the embryo; the amnion and amniotic fluid protect the developing embryo from shock.

**Artificial Insemination-** the introducing of male reproductive cells into the female reproductive tract by artificial means, commonly abbreviated AI.

**Avian-** Of or pertaining to birds.

**Beak-** The protruding mouthpart of a bird.

**Blastoderm-** The collective mass of cells produced by the division of a fertilized ovum and from which the embryo develops.

**Blastodisc-** The embryo-forming spot on the ovum, from which the blastoderm develops after the ovum is fertilized by a sperm.

**Broiler-** A young meat-type chicken, usually weighs between 1.7 and 2.5 kg live (3.5-5.5 lbs.) And takes from 39-42 days to reach this weight.

**Broody hen-** A hen that wants to sit on eggs to hatch them and to brood chicks.

**Candling-** Observing the shell and the contents of the egg (air cell, embryo) through the shell by holding the egg up to a bright light focused on the shell.

**Chalazae-** Tiny white cords of protein fiber that are twisted like a rope at each end of the yolk. They anchor the yolk in the center of the egg shell cavity.

**Chorion-** A membrane that surrounds both the yolk sac and the amnion.

**Cloaca-** The vent or common opening in birds through which the intestinal, urinary and reproductive tracts empty.

**Comb-** The fleshy, red outgrowth on top of a chicken's head.

**Cornish hen-** A young chicken, with very tender meat, usually weighs between 1 and 1.1 kg live (2.2 lbs.) And is ready for market in 28 days.

**Down-** Soft, fine, hair-like feathers on young birds.

**Dry-bulb thermometer-** An instrument that expresses the temperature reading in degrees Fahrenheit or Centigrade.

**Egg tooth-** A temporary, tiny, sharp projection on the end of the chick's beak used by the chick to break through the shell.

**Embryo-** A fertilized egg at any stage of development prior to hatching.

**Embryology-** The study of the formation and development of embryos.

**Evaporation-** The changing of moisture (liquid) into vapor (gas).

**Eviscerated-** The internal organs have been removed from the chicken.

**Feeder-** A container which holds feed.

**Fertile-** Capable of reproducing. Fertilization- The union of a male cell with a female cell.

**Giblets-** The internal edible parts of the chicken and include the heart, liver and the gizzard.

**Gizzard-** An internal organ of birds used for crushing and grinding foods by muscular action and with pebbles or grit.

**Gonad-** A gland that produces reproductive cells; the ovary or testis.

**Hatching eggs-** A fertilized egg with the potential for producing a chick.

**Incubate-** To maintain favourable conditions for developing and hatching fertile eggs.

**Incubator-** A container with the proper humidity and temperature for hatching fertile eggs.

**Infundibulum-** The entrance to the oviduct.

**Layers-** Mature female chickens kept for egg production.

**Litter-** Any bedding material which provides animals with safe footing, and keeps them warm, clean and comfortable.

**Membrane-** A thin, soft, pliable sheet or layer of tissue covering an organ.

**Navel-** The navel is the place where the abdomen closes after surrounding the remains of the yolk.

**Ovary-** The female reproductive gland in which eggs (ova) are formed.

**Oviduct-** The tube through which eggs pass after leaving the ovary.

**Ovum-** The female reproductive cell.

**Papilla-** In the rooster, tiny projections in the cloaca through which semen is ejected.

**Pipping-** A baby chick breaking from its shell.

**Pores-** In the shell of an egg, thousands of minute openings through which gases are exchanged.

**Poult-** A baby turkey.

**Poultry-** Domesticated fowl raised for meat and eggs, usually chickens and turkeys.

**Pullet-** A female chicken under one year of age.

**Relative humidity-** The amount of moisture in the air compared to the amount the air could contain at that temperature; expressed as a percentage.

**Roaster-** A young meat-type chicken, of either sex, that can be cooked tender by roasting, and usually weighing about 3 kg live (6.6lbs) and is grown in 50 days.

**Sac-** A bag like part of an animal or plant, often containing some special fluid.

**Semen-** The fluid secreted by the male reproductive organs. Serves as a vehicle for the sperm.

**Set-** To put eggs in an incubator or under a broody hen to hatch them.

**Shell-** The hard outer surface of an egg made up largely of calcium carbonate.

**Shell membranes-** Two thin membranes next to the shell and surrounding the albumen and yolk; known as inner and outer shell membranes.

**Sperm-** The male reproductive cell. Stewing hen- A mature chicken (generally a laying hen) about one year old, having tougher meat, less fat and more connective tissue than a younger chicken.

**Testes-** The male genital glands (singular - testis).

**Ventilation-** The movement or exchange of stale air for fresh air.

**Wattles-** The fleshy, red growths that hang from the side and base of the chicken's beak.

**Wet-bulb thermometer-** A device that measures moisture or water vapor in the air.

**Yolk-** The round yellow mass upon which the true egg is located and that provides nutrients for the developing embryo.

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## Incubation Quick Reference

Before you begin to incubate eggs, you must first set up the incubator and allow it to operate for a few hours before placing the eggs in it.

**Day 1:** Mark an “x” on one side and an “o” on the other side of each egg with a pencil. Place the eggs in the incubator, this will cause the incubator temperature to drop. Do not adjust the temperature upward during the first 24 hours after eggs are set. The eggs will take time to warm to incubator temperature.

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*Always wash hands  
thoroughly before and  
after handling the eggs.*

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**Day 2:** Begin turning eggs twice daily. Use care in turning eggs as rough handling could rupture blood vessels.

**Day 3:** Remove the one vent plug and leave it out for the remainder of incubation.

**Day 4-17:** Continue to turn the eggs every day. Add water to the short water trough every few days.

**Day 5-17:** The eggs may be candled anytime during this period. By day 10 eggs should be candled and infertile eggs (clear ones) removed.

**Day 18: Stop turning the eggs.** Fill all water troughs with warm water. Do not open the incubator. If water droplets develop on the incubator window remove some of the water.

**Day 21: Hatch Day!!** On day 21 have your brooder box set up with a waterer, feeder, chick starter, bedding and the heat source suspended above it. Once the chicks are dry, move to the brooder.

For more detailed information and classroom activities please refer to the chick hatch manual.

## Directions for Setting up the Hova-bator (circulated air model) Incubator

**Note:** This is the incubator that is provided. If you are using an incubator you acquired elsewhere, then please refer to the directions included with that model.

1. Set the incubator on a sturdy level table and away from direct sunlight and drafts. It is also desirable to find a location where the risk of being bumped is minimized.
2. Place wire rack in bottom.
3. Fill moisture troughs #1 and #2 (in incubator bottom) with warm water. If your humidity remains low than 35% consistently, you can fill troughs #3 and #4, if needed.
4. Place red vent plugs in holes on incubator top. If a vent plug is missing, then cover the vent hole with adhesive tape.
5. Place yellow egg turner on top of wire or plastic rack.
6. Place top over bottom and plug in incubator. Check the temperature on the top readout.
7. The temperature has been pre-set for you. For chicken eggs the optimum temperature is 37.5°C (99.5°F).
8. The red light will come on when the heat is on. Allow the incubator to operate for a couple of hours to stabilize before putting in eggs. Do not adjust the temperature for at least the first 24 hours – unless it is over 37.5°C (99.5°F)







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