

Painted Lady Butterfly Power Pack

9 facts you may not know about Painted Lady Butterflies and how to use them in the classroom

There is no better way to study life cycles than by observing the complete metamorphosis of live butterflies. Provide your students with this extraordinary experience for a spring science lesson they'll never forget.

Raising Painted Lady butterflies isn't just a great hands-on demonstration of the butterfly life cycle; it's also a way to help students learn a range of fascinating concepts like migration, photonic crystals, biopolymers, and insect endocrinology.

Here are nine facts your students will be amazed to discover:

1. **The Painted Lady butterfly and other insects are part of a class of invertebrates within the phylum *Euarthropoda*, including arachnids, myriapods, and crustaceans.** Arthropods have an exoskeleton, segmented bodies, and jointed appendages.
2. **The Painted Lady butterflies are one of the brush-footed butterflies (family Nymphalidae), also called four-footed butterflies.** They have a five to nine-centimeter wingspan and live for about two to four weeks.
3. Painted Lady butterflies are found on every continent in the world except Antarctica and Australia.
4. **In the wild, the females lay about 500 eggs in their short 2–4-week lifespan.** To put that in perspective, the best laying chicken breeds can only lay about 5–6 eggs per week. Ok, they're fundamentally different species, but 500 butterfly eggs are still impressive for the lovely little lady.
5. **During migration, the Painted Lady species travels a phenomenal 9,000-mile round trip from tropical Africa to the Arctic Circle!**¹ Sorry North American Monarchs, that's almost double the distance of your significant migration.
6. We think of a cuticle as something on our fingers and toes, but that word refers to the skin (exoskeleton) on caterpillars. **The exoskeleton is made of a biomaterial called chitin (fact #9 below explains the cool way chitin also affects butterfly wings).** Chitin is one of the most important biopolymers in nature.² It's the same biomaterial that lobsters, crabs, and other arthropods use in their hard exoskeletons. Strong hydrogen bonds between the chitin chains give chitin exceptional toughness, protecting the caterpillar's soft insides until it goes through metamorphosis. Or in the case of the lobster, protecting its succulent flesh until it turns into our buttery, gourmet dinner! Being that tough means that chitin doesn't stretch with growth, so caterpillars and other arthropods periodically shed their exoskeletons, i.e., they molt.
7. **The larval stage of the Painted Lady butterfly is about 5 to 10 days.** The caterpillars will eat and eat and eat; after all, how else are they going to turn into gorgeous butterflies? Caterpillars can consume 200X their birth weight in less than two weeks. They will increase their body mass by as much as 1,000 times or more during this stage. Imagine a seven-pound newborn child consuming 1400 pounds of formula in two weeks.³ As the caterpillar grows, its skin gets too tight, triggering a hormone (ecdysone) that regulates the molting process. A caterpillar changes its skin about four times before it's fully grown and ready to go into the chrysalis stage. And, no surprise, the voracious caterpillar doesn't just shed that skin; it digests and reabsorbs most of it. What an appetite!

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(continued)

1. **Like spiders, caterpillars produce silk through a “spinneret.”** This tube-like structure is located on the lower side of the caterpillar’s mouth. The caterpillar excretes liquid silk from its salivary glands then through the spinneret. When the liquid hits the air, it turns into a solid silk strand. Silk is one of the strongest natural fibers—it’s said that pound for pound, silk is stronger than steel. Although, the spider’s silk is stronger than not just steel, but also Kevlar!⁴ If you have a butterfly habitat, you can observe them attach to the roof before forming a chrysalis. The caterpillar uses silk from its spinneret to secure itself and build its chrysalis.
2. **Butterflies use complex structures called photonic crystals to scatter light and create that distinctive iridescent look.**⁵ Scientists used powerful x-rays at the Advanced Photon Source at Argonne to get a unique look at the structure of the tiny crystals that make up butterflies’ wings. The results show us how the wings get their iridescent, brilliant colors. “We also found tiny crystal irregularities that may enhance light-scattering properties, making the butterfly wings appear brighter.” These “defects” grow as a result of the chirality—the left or right-handedness—of the chitin molecules from which butterfly wings are formed,” said co-author Ian McNulty, an X-ray physicist with the Center for Nanoscale Materials at Argonne.

In addition to being extremely easy to maintain in your classroom, you can use these live critters to:

- Demonstrate a full life cycle
- Visualize development quickly—most develop between 14 to 26 days
- Study habitats and environments

1. Butterfly Conservation: Painted Lady migration secrets revealed 2. Journal of Experimental Biology: Chitin metabolism in insects: structure, function, and regulation of chitin synthases and chitinases, Hans Merzendorfer, Lars Zimoch. 3. The Texas Butterfly Ranch. 4. Everything Silkworm: Silkworm Thread vs. Spider Thread: Strength, Thickness & Future Uses. 5. Argonne National Laboratory: X-rays reveal the photonic crystals in butterfly wings that create color, Louise Lerner.

Painted Lady Butterfly

Species: *cardui*
Genus: *Vanessa*
Family: Nymphalidae
Order: Lepidoptera
Class: Insecta
Phylum: Arthropoda
Kingdom: Animalia



Conditions for Customer Ownership

We are a USDA compliant facility and hold all necessary permits to transport our organisms. Each state is assisted by the USDA to determine which organisms can be transported across state lines. Some organisms may require end-user permits. Please contact your local regulatory authorities with questions or concerns. To access permit conditions, [click here](#).

Primary Hazard Considerations

Wash your hands before and after handling larvae, chrysalids, adult butterflies, and their food. We advise that you not touch the food with your bare hands (use utensils or wear disposable gloves) in order to limit contamination that can inhibit successful development.

Availability

Lab-reared Painted Lady larvae, such as ours, are available year-round. When ordering large quantities (more than 20 Sets of 30 larvae) we suggest that you order at least two weeks in advance in order to ensure availability.

How Will Animals Arrive and Immediate Requirements

- We over-pack each order of butterfly larvae. It is normal to have some deceased butterfly larvae in the container. You will receive at least the quantity of live butterfly larvae stated on the container.
- Periodically, the larvae may appear lifeless as they undergo molting. Cold temperatures can also slow down the larvae. Allow the cup to come to room temperature and check back after 1–2 hours to make sure the larvae have survived transit.

Set of 5 Larvae:

The set of five larvae (470188-574) is shipped in one container with enough food for the larvae to complete their development into pupae. It is not necessary to transfer them to another container at this time. Place the container upright at room temperature, out of direct sunlight, and in an area where you can easily watch the development process. The container should not be shaken or disturbed if possible.

Set of 30 Larvae:

- Sets of 30 Painted Lady larvae (470227-450) come with one cup containing at least 30 larvae, one bag of dry food (follow instructions on bag to prepare), 33 small plastic cups with lids, one spoon, and one paintbrush. Complete kits/habitats also come with a large cage.
- The set of 30 larvae comes with food coating the bottom and sides of the cup. There is only enough food in this container to sustain them during shipping. They will need to be distributed into the smaller cups with additional food. If left in the large cup, the larvae will become overcrowded, run out of food, and will soon die. It is best to transfer the larvae when they are between $\frac{3}{4}$ cm and $1\frac{1}{2}$ cm. This is usually within two days of receiving the larvae.
- Due to natural variations in hatching rates, our Sets of 30 larvae will often come with extra larvae. If you wish to raise any of the extra larvae, you can purchase additional media (470180-624) and cups (470227-454) from us. If you do not wish to raise any extra larvae, you can give them to another teacher or parent to raise, or humanely euthanize them by following the disposition instructions that follow.

Detailed Care Instructions

Transferring the Larvae into the cups (sets of 30 only):

1. Prepare food by combining the bag of dry powder (contains 100 g) with 1¼ cups (296 mL) of distilled or spring water in a clean container. Add the water slowly while mixing well with a spoon until the food is the consistency of stiff cookie dough. The prepared food may be stored in an airtight container in the refrigerator for up to one month.
2. Using the enclosed spoon, place a level spoonful of food into each individual cup and push the food into the bottom of the cup, at an angle. Then, using the paintbrush, very gently place one larva into each cup.
3. Put one lid securely on each cup, and punch several air holes in each lid with a pushpin.
4. Place the cups at room temperature (65–80°F), out of direct sunlight, and in an area where they can easily be viewed. The cups should not be shaken or disturbed if possible.

As they grow:

The caterpillars will grow quite rapidly, producing silky strands that provide shelter and help them move around the container. The caterpillars will excrete waste that looks like brown balls on the surface of the food. It is not necessary to remove the waste from the cups. Periodically, the caterpillars may appear lifeless during the growing period. This is normal and usually indicates that the caterpillar will be molting shortly.

Pupation & transferring to a larger cage:

When the caterpillars are fully-grown, approximately two weeks after receipt, they will stop feeding, crawl to the top of the cup, and hang down headfirst. Do not disturb the caterpillar at this stage; it is fragile as it transforms into a chrysalis.

1. Wait 24 hours for the chrysalides to harden before transferring them. Carefully remove the lids or paper towel with the attached chrysalides and tape them to the inner sides of your chosen box or cage (470215-426). A strong tape such as electrical tape (470020-186) or masking tape (470093-370) is recommended. You should use a container that has air holes, mesh, etc. to allow for air exchange, but make sure there are no openings large enough for the butterflies to escape through (openings should be ½" or smaller). We recommend a cage that is at least 8"W x 8"D x 6"H for 5–6 butterflies, and at least 12"W x 12"D x 9"H for around 30 butterflies. Line the bottom of the cage with paper towels or butcher paper to absorb moisture.
2. If any of the chrysalides have fallen into the bottom of the cup, carefully remove them and gently wipe off any debris. Hang the fallen chrysalis by attaching its small pointed tip to a cotton ball or household string, and then tape the cotton or string to the lid or wall of the cage. Hanging the chrysalides will allow the wings of the butterflies to develop normally. It is very important not to puncture or squeeze the chrysalides during this process. Work very gently, using clean fingers or insect forceps.
3. Mist the chrysalides a few times a day to keep them from drying out, particularly when in a low humidity (<40%) environment.

Emerging as butterflies:

In about one more week, the butterflies will emerge, and after a short period of pumping up their wings, will be ready to fly! During this time, the butterflies may excrete a red-colored liquid called meconium. This is the normal metabolic waste product from the development process.

1. Feed the butterflies by wetting a piece of cotton or paper towel in a solution of 5 tablespoons of sugar mixed with 1 cup of water (20% solution). Place the saturated piece of cotton in a shallow dish on the floor of the cage. Although brown sugar is preferred, white sugar can also be used. Honey is not recommended for feeding, as it may clog their mouth tubes. If desired, you can add a small amount of bee pollen to the sugar water; bee pollen is not necessary, but it does provide the adult butterflies with amino acids. Butterflies also like slices of fresh fruit such as oranges.
2. Mist the adult butterflies a few times a day. The water prevents their wings from drying out and aids digestion.
3. Butterflies may be kept in their cage for the entirety of their 2 to 4 week adult life span.

Information

- **Method of Reproduction:** Painted Lady butterflies undergo sexual reproduction. Once a male finds a receptive female, they attach at their back ends, and the male deposits sperm. Later the female will lay up to a few hundred tiny pale blue-green eggs on leaves of their chosen host plant.
- **Determining sex:** It is fairly difficult to sex Painted Lady Butterflies, although the abdomen of the male is usually smaller than that of a female.

Life Cycle

Painted Lady Butterflies undergo complete metamorphosis. They begin their life as a tiny blue-green egg, no larger than the head of a pin. After about 3–5 days a grayish larva (also called a caterpillar) will emerge from the egg, and then begin feeding. Over a period of about 2–3 weeks the larvae will grow to about 1½" long. The larvae will usually undergo five molts (the process of shedding the old exoskeleton while expanding and hardening the new one underneath). In the final molt, a pale brown chrysalis (also called a pupa) is formed. The chrysalis displays little movement and functions like a shell to protect the organism for about 10 days as it develops into the mature butterfly. Emergence from the chrysalis is similar to the hatching of an egg, where the butterfly struggles to emerge through a crack in the chrysalis. At first, its wings are folded and crumpled, but soon the butterfly begins pumping up its wings. This forces fluid from its abdomen into its veins, helping its wings inflate to the proper size (about 2½" wide) and shape. After a couple hours, the butterfly is ready to begin flying. In captivity the adult butterflies can usually live for about 2–4 weeks.

Wild Habitat

- The Painted Lady butterfly is the most widely distributed butterfly in the world. It is native to North America, Africa, Europe, and Asia. In North America, the Painted Lady can be found in the majority of U.S. states as well as Canada, and as far north as the Arctic Circle. During the winter months, Painted Ladies become concentrated in the southwestern region of the continent. In early spring, they begin to re-colonize the northern and eastern regions. Their natural habitat is bright, open grasslands, woodlands, and deserts.
- The Painted Lady larvae feed on many different types of host plant families such as Asteraceae/Compositae (includes Asters, thistles), Urticaceae (nettles), and Malvaceae (mallows and hollyhocks). Adult butterflies consume nectar from an even larger variety of flowering plants.

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- In the wild, the main predators of the egg stage of the Painted Lady are other insects, and their only defense is their greenish color that blends in with the leaves that they are laid upon. Predators of the larvae stage are ants, birds, and reptiles. Birds and reptiles are also predators of the chrysalid stage. The chrysalids use their pale brown color to blend in with the underside of leaves, and they shake when they feel something touch them, which discourages predators. Birds, reptiles, and frogs are the major predators of the adult Painted Lady, but the butterflies are very sensitive to light changes and movement and can often escape their predators through quick flight.

Disposition

We do not recommend releasing any laboratory-bred animal into the wild, and especially not insects that are considered to be pests by the USDA. We recommend that you keep adult Painted Lady Butterflies in their habitat/cage for their entire 2–4 week life span.

- If you need to euthanize any larvae, chrysalids, or butterflies, one of the following steps should be taken before disposing:
 - Place the organism in a freezer for 48 hours.
 - Place the organism in 70% isopropyl alcohol for 24 hours.
- A deceased specimen should be disposed of as soon as possible. Consult your school's recommended procedures for disposal. In general, dead insects should be handled as little as possible or with gloves, wrapped in an opaque plastic bag that is sealed (tied tightly) before being placed in a general garbage container away from students.