



SWIFT

OPTICAL INSTRUMENTS

Exceptional Optics ■ Durable Construction ■ Innovative Designs

Lesson Plan

Pieris Rapae: Cabbage White Butterfly Teacher Guide

Objective:

To observe and identify body parts of *Pieris rapae* while demonstrating sound stereoscope and microscope skills.

Relation to National Standards:

- Unifying concept of Form and Function
- Unifying concept of Evolution
- Unifying concept of Evidence, Models and Explanation
- Life Science standard of Interdependence of Organisms

Materials:

- Deceased *Pieris rapae* (enough for 1-2 per every 2-student team)
- Stereo microscope
- Compound microscope
- Tweezers
- Probe
- Microscope slides and coverslips
- Water in dropper bottles (for making wet mount slides)

Procedure:

1. Using tweezers obtain a dead *Pieris rapae* and place in uncovered petri dish. Determine and record the butterfly's sex by noting the number of black spots on the wings. Females have a dark spot at the outer edge of the forewing and two dark spots mid-wing – males have only one (Kulzer, 1993).

2. Center the butterfly in the field of vision and, observe the butterfly at 10X objective power using. Continue to examine the butterfly at 20X, 30X and 40X, noting veins in the wings and hair-like structures on the body and wings. (Different stereo microscopes have different magnifying powers. You will need to adjust accordingly). You may find it useful and interesting to use light from below as well as lighting from above to study the butterfly.

3. Locate and diagram the following parts (Figure 1):

- 2 fore wings (upper)
- 2 hind wings (lower)
- Thorax (section between head and abdomen; wings and legs are attached to it)
- Abdomen
- Compound Eye
- Proboscis
- Antennae
- 6 legs

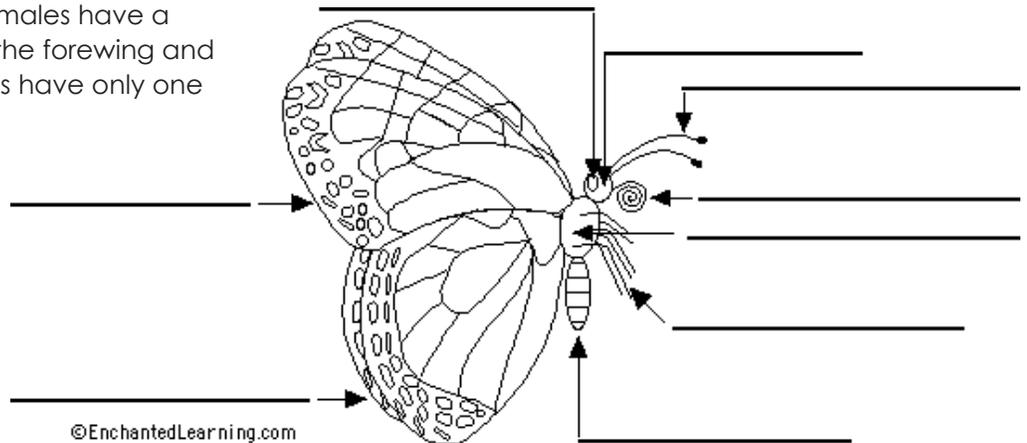


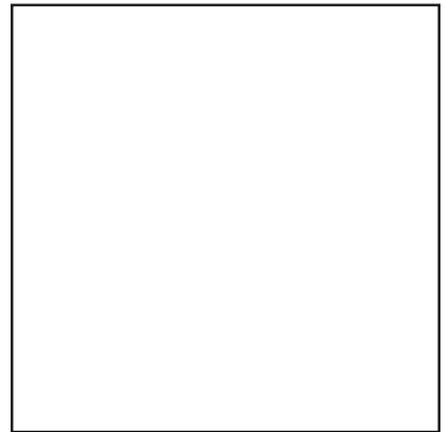
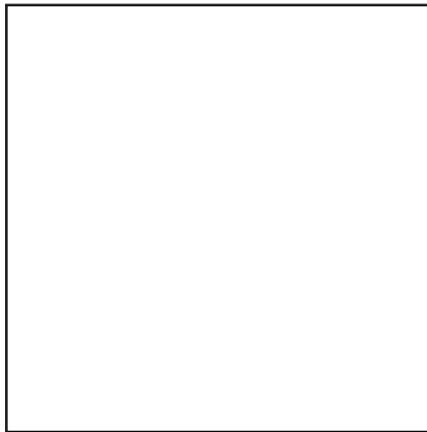
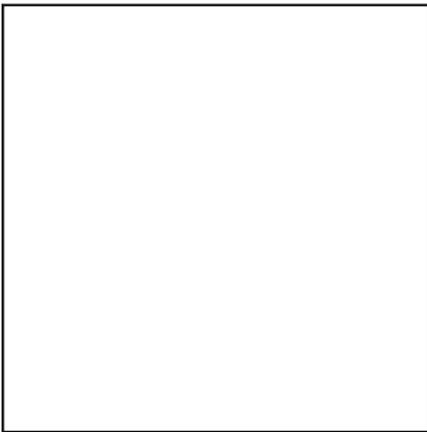
Figure 1 (Source: www.enchantedlearning.com/subjects/insects/label/butterfly.shtml)



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Observe the eye, proboscis, and antennae at 20X. Diagram and describe them below.



4. Remove a forewing and make a wet mount slide. Now use your compound microscope and, observe the wing at 40X. Be sure not to fold the wing over on itself as this will make it more difficult to observe. You will see overlapping scales arranged like shingles on a roof. Draw and describe their shape and colors. As you adjust the focus knob, you will also see hairs coming off the wing as well.



As you adjust the fine focus knob, do you see one or multiple layers or scales?

Observe the wing at 100X then 400X and draw a representative section of scales, noting color and shape.





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5. Remove a leg and antennae and prepare a wet mount slide of both. Observe and draw each at 100X. You may see small, leaf-shaped scales that have come off the leg. The leg has a club-like tip with hairs attached; what might be the function of these hairs?

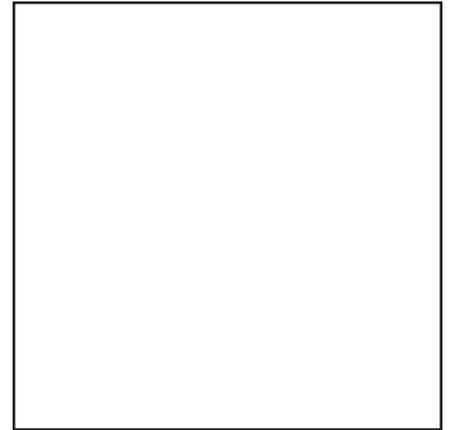
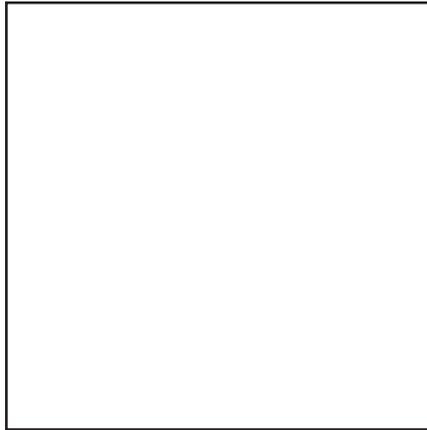
6. Switch the power to 400X and take a closer look at the hairs on the leg. Do the upper legs and hairs transmit light? What might be the benefits of a hollow leg or hair on a butterfly?

7. Observe the antennae; how does it differ from the leg.

8. Clean-up.

Digital Microscopy Applications:

The SwiftCam 2 or SwiftCam 3 fits most stereo and compound microscopes by using one of the appropriate adapter rings that are included in the package. The Swift Cam 2 or Swift Cam 3 imaging software allows the user to capture images. Students may capture an image to answer questions 1-6. Students may then identify the parts by using the tool bar to add text, icons, and other annotations. The software allows for a full range of editing, measuring, and filtering options. This activity may be expanded to ask the student to take measurements of the identifiable parts. Students may then save the images for later use in PowerPoint presentations or for use on a home/web page. Please consult your school IT for guidelines.



Suggested assessment:

- Formal: Grade lab sheets and diagrams for accuracy.
- Informal: Observe students during activity.
- Virtual: Using image capture software, capture the images, and label.



Sources

Kulzer, Louise, 1993. *Pieris rapae*, the Cabbage White Butterfly Scarabogram, April 1993, New Series No. 156, pp. 2-3.