

Insect Life Cycles Student Handbook

Name: _____

Class: _____

Group: _____

Date: _____

Insects are the most abundant and diverse animals in the world, and we can find them no matter in water or on land.

Of all the insects, butterflies are one of the easiest to observe. Generally, butterflies are large, colourful, and common in both urban areas and the countryside, making them a good teaching tool.

Since insects are the most abundant living creatures on earth, they are closely related to nature and our daily lives.

Let us learn more about butterflies in the following lessons to explore the relationship between insects and the environment!



Okay!



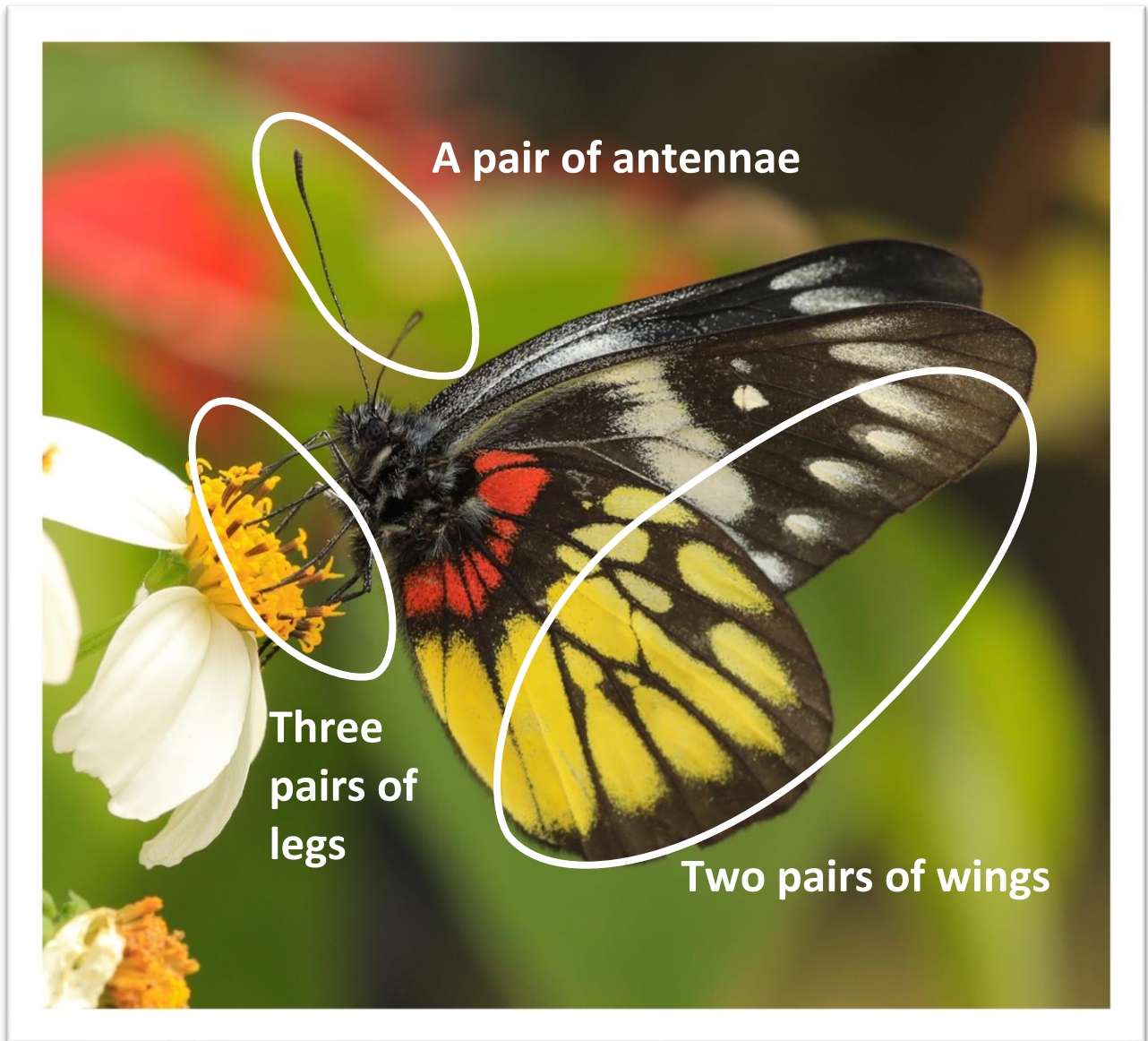


Before learning more about insects, we must first know how to distinguish whether an animal is an insect. Now let's review some common characteristics of insects!

1.1 How Butterflies Look Like

Do you remember what butterflies look like? Please draw a butterfly in the space below and **circle two characteristics of insects!**

A large, empty white rectangular box with rounded corners, intended for a student to draw a butterfly. The box is centered on the page and occupies most of the lower half of the page.



What do butterflies actually look like?



Let me share one of my butterfly photos with you! Its name is **red-base Jezebel**, and it is widespread in Hong Kong. I also labelled some common characteristics of insects on the photo! Does the butterfly you just drew look similar to this butterfly?



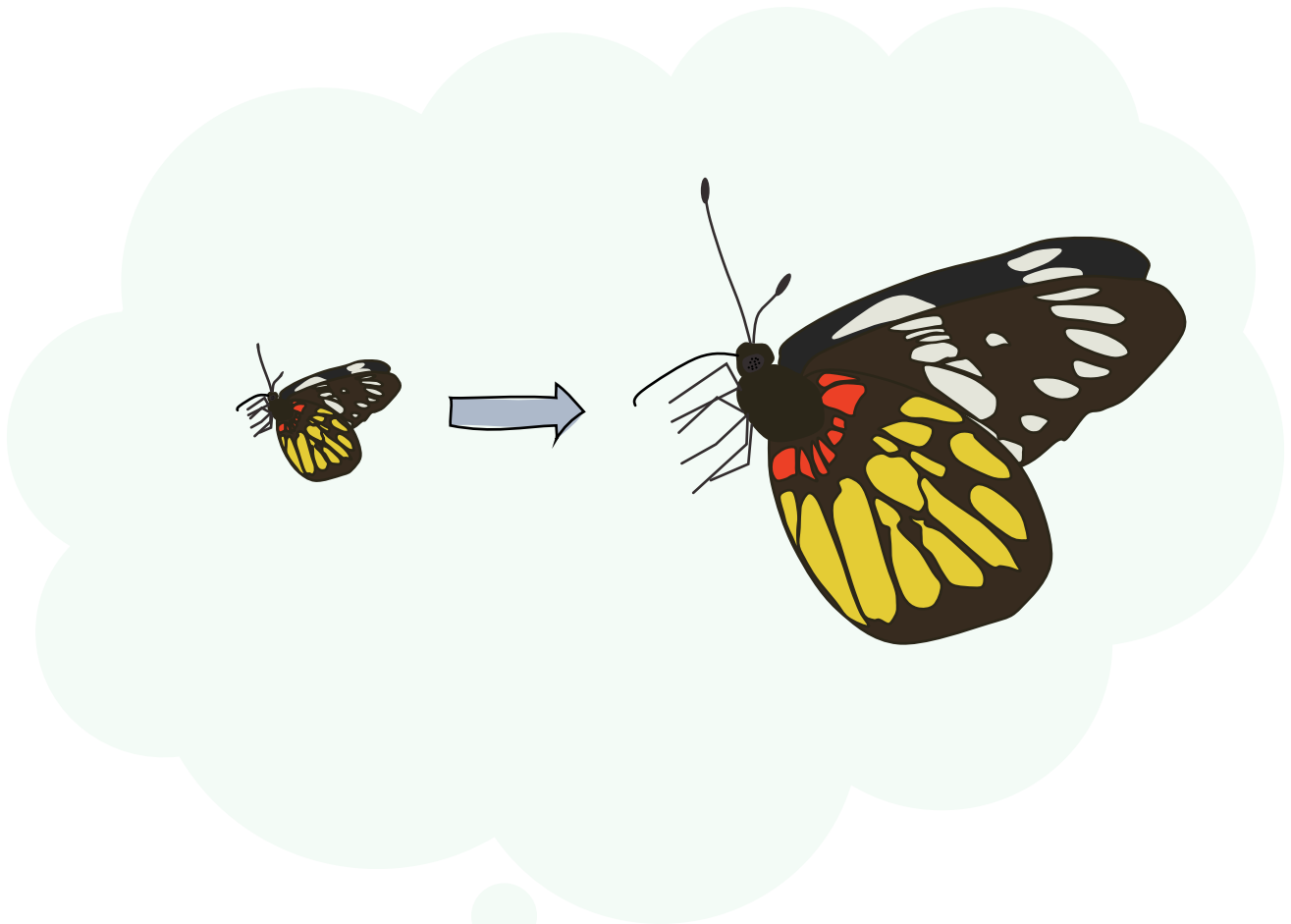


In addition to butterflies, I also have other lovely photos of animals. You can find all these animals in Hong Kong. Can you tell which animals are insects?

1.2 Identifying Insects

Which of the following animals are insects? Please fill in “✓” in the blank.





Wow! Butterflies are so beautiful! I wonder if they always look the same when they grow up.

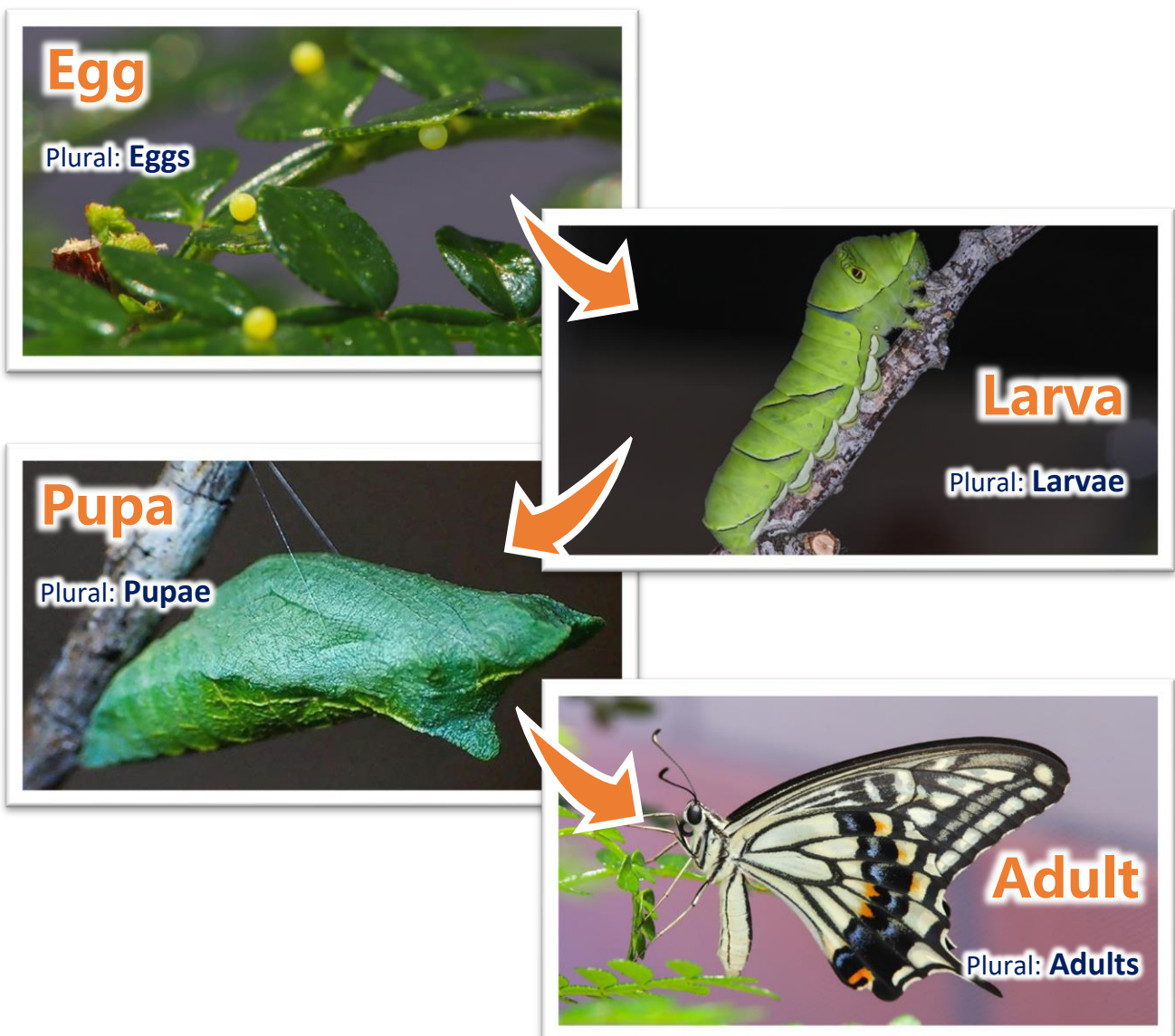


Of course not! Butterflies are different from us. Their appearance changes a lot when they grow up. Let me show you what butterflies look throughout their growth process!



Complete metamorphosis and incomplete metamorphosis

The appearance of insects changes in varying degrees as they grow. This process is known as “metamorphosis”. There are two types of metamorphosis, including **complete metamorphosis** and **incomplete metamorphosis**. The most significant difference between the two is that insects with complete metamorphosis have **four life stages**: egg, larva, pupa, and adult. In comparison, insects with incomplete metamorphosis only have **three life stages**: egg, larva, and adult.





Let's take a quiz now to see if you understand the difference between insects with **complete metamorphosis** and **incomplete metamorphosis**!

1.3 Insect Life Cycle

Use numbers to arrange the growth stages of the following insects in increasing order from birth (1 → 2 → 3 or 1 → 2 → 3 → 4) and fill the answers in the ○.



Butterflies undergo (complete / incomplete) metamorphosis.



Dragonflies undergo (complete / incomplete) metamorphosis.

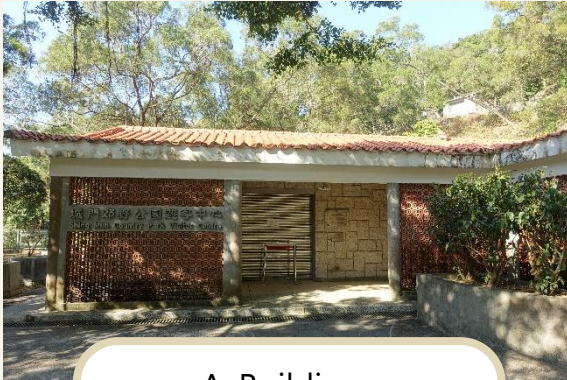
Butterflies are such amazing creatures. I can't wait to go out and meet them!



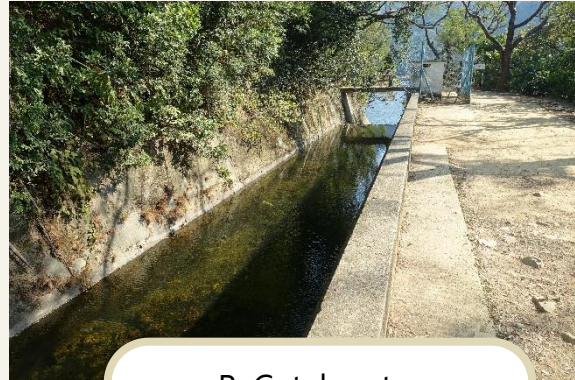
Don't hurry! In fact, some habitats are more attractive to butterflies. If we know where to look for them, we can get twice the result with half the effort! Kids, do you know where you can find the most butterflies?

1.4 Where are the Butterflies?

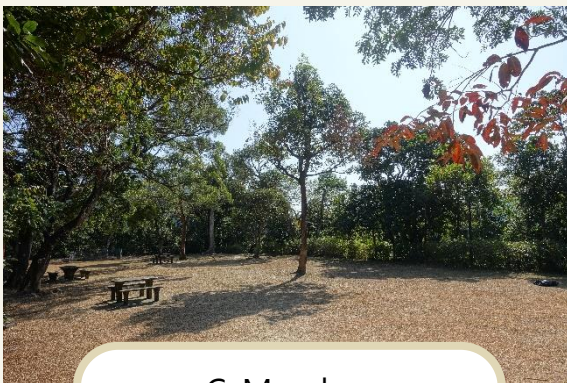
Discuss with your groupmates at which environment you could find the most butterflies and explain your answer.



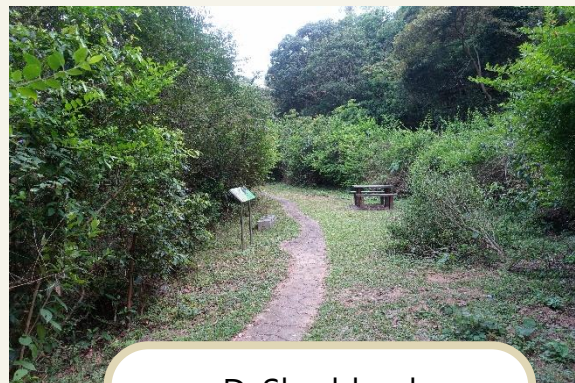
A. Buildings



B. Catchwater



C. Meadow



D. Shrubland

We predict that we could find the most butterflies at A / B / C /
D, because _____

_____.



It's finally time for the field trip! I hope I will see all kinds of butterflies today!

Safety is the most important thing no matter what outdoor activities you're doing. Let's read over the "Safety Tips and Precautions" first!



Safety Tips and Precautions for the Field Trip

- Wear appropriate clothing, such as light-coloured long sleeved clothing and sneakers.
- Follow the instructions of the teachers. Running, yelling and leaving without permission are not allowed.
- Observe patiently. Do not touch, disturb or harm wildlife.
- Cherish the natural environment and take your litter home.
- Stay calm during an emergency and ask the teachers for help.

Self-evaluation (complete this part after the field trip)

- I successfully comply with **4 to 5** rules. I will continue to maintain a good hiking attitude.
- I successfully comply with **1 to 3** rules. I will pay more attention to my hiking attitude while carrying out other outdoor activities in the future.
- I **failed to comply with** any rules. I will continue to work hard to improve my hiking attitude.



Since the field site of today's field trip, Shing Mun Country Park, is within the monkeys' territory, you may have a high chance of encountering them. Please remain calm when there are monkeys nearby and take the following advice:

What to Do When You See a Monkey?

- Do not feed the monkeys.
- Avoid carrying plastic bags. Hide all plastic bags away in a backpack.
- Do not eat when there are monkeys around.
- Do not stare at the monkeys as staring would provoke them.
- Do not throw any food or objects at the monkeys.
- Do not approach the monkeys, especially the babies. Stay at some distance from them.
- Do not make any loud noise. Noise would make the monkeys nervous.
- If you come into contact with any wild animals (include monkeys) or their excreta, please wash your hand thoroughly by soap and water immediately.



Before the field trip, let's get to know some background information about the field site – Shing Mun Country Park!

Shing Mun Country Park

Shing Mun Country Park is one of the first country parks in Hong Kong. It is a hotspot for tourists because of its beautiful scenery. Shing Mun Reservoir located within the country park allows visitors to enjoy lakes and mountains, and the place is of great historical value.

Shing Mun Reservoir (Upper Shing Mun Reservoir)

Shing Mun Reservoir was first built in 1923, and the entire construction process lasted for 14 years. It was built to cope with the rapidly increasing demand for freshwater from people living in Hong Kong Island and Kowloon at that time. Since it was established during the 25th anniversary of King George V's accession to the thrones of the United Kingdom and other Commonwealth realms, it was also named "Jubilee Reservoir". The monument erected to commemorate the completion of the reservoir was listed as a declared monument in 2009.



War relics



In the 1930s, Japan launched a full-scale invasion in China, and Hong Kong was not immune to it. To protect Hong Kong against Japanese invasion from the north, the government decided to build the Gin Drinkers Line, which originated from Gin Drinkers Bay (nearby Kwai Chung area now) and ended at Port Shelter in Sai Kung District starting from 1937 to 1938. The Shing Mun Redoubt, located at south of Shing Mun Reservoir, even housed a command headquarter for the defensive line. However, the Japanese military took over the defensive line in 1941, leading to the fall of Hong Kong. At present, traces of the war can still be found in the Shing Mun Redoubt.

Ecological value

Shing Mun Reservoir is no longer a military site or the main source of fresh water supply, but it is getting more attractive to people because of its high ecological value. Shing Mun Reservoir is surrounded by rich and diverse habitats, such as woodlands and streams, which are suitable for various species to inhabit. For example, more than 120 butterfly species have been recorded in the west of the reservoir, some of which are even of conservation value, such as golden birdwing.



Try to share the information with your family and friends when you visit Shing Mun Country Park with them!

Map of field trip route





Now let me tell you about the objectives of today's field trip! In the last lesson, you predicted which environment you have a greater chance of finding the most butterflies. Today the teachers will take you to locations that have similar environments. You need to conduct butterfly observation activities to **record the number and types of butterflies** at each location and **count the number of visits in each environment by each butterfly**. Prove whether your prediction is correct or not!

But in fact, except for the **red-base Jezebel** you introduced before, I am not familiar with other butterflies. Will this hinder my progress during the field trip?



Don't worry! You can find more information about butterflies and examples of different types of butterflies from the **Species Identification Guide**! If you're ready, let's look at the procedures for conducting the field trip activity!

2.1 Field Trip Activity: Butterfly Investigation

After arriving at each designated location, follow the procedures below to conduct the activity:



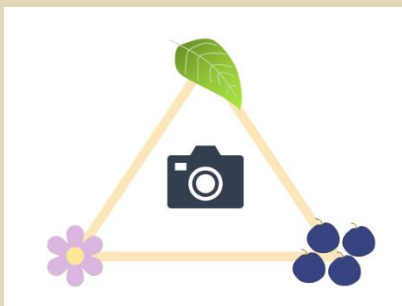
1. After arriving at each location, you have **10 minutes** to observe and count the butterflies. When you find the butterflies, please spend about **30 seconds** tracking each butterfly and record the numbers of visits from that butterfly to the following environments (on the ground, buildings, water, plants, and flying).



2. Record the characteristics of each butterfly you found and try to photograph each butterfly. Suppose it is too hard to capture the butterflies because they fly too fast or are far from you. In that case, you can write down their characteristics for counting the types of butterflies.

Tips for finding and observing butterflies:

Butterflies usually appear near plants that are in flower, so try looking for them near these plants. Also, when identifying butterflies, try looking at their size and colour and use the **Species Identification Guide** to help you identify them.



3. If the butterfly has visited a plant, please take photos of that plant (such as leaves, flowers, and fruit) and try to identify the species later.



4. Try to identify the butterflies and plants in the photos you took during the field trip using the **Species Identification Guide** or other methods.

Binocular



Magnifier



Photo-taking device



Species Identification Guide



Stationeries



Timer



Finally, we must make sure that we have prepared all the materials and tools needed for the field trip. Now let's check if all materials and tools have been well prepared and get familiar with them.

How to record your findings (example)

Checkpoint: Visitor centre (fill in according to teachers' instructions)

Characteristics of this checkpoint: a meadow surrounded by buildings

Butterfly name	Characteristics	Number of visits in each environment by each butterfly within 30 seconds (leave the spaces blank if none of the options apply)				
		On the ground	Buildings	Water	Plants	Flying
1. Common hedge blue	Grey wings				2	1
2. Common hedge blue	Grey wings				1	1
3. Red-base Jezebel	Red, yellow, and white patterns on black wings				1	
4.						
5.						
Total					4	2

Number of butterflies: 3 How many types of butterflies: 1

Checkpoint: _____ (fill in according to teachers' instructions)

Characteristics of this checkpoint: _____

Butterfly name	Characteristics	Number of visits in each environment by each butterfly within 30 seconds (leave the spaces blank if none of the options apply)				
		On the ground	Buildings	Water	Plants	Flying
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
Total						

Number of butterflies: _____ **How many types of butterflies:** _____

Checkpoint: _____ (fill in according to teachers' instructions)

Characteristics of this checkpoint: _____

Butterfly name	Characteristics	Number of visits in each environment by each butterfly within 30 seconds (leave the spaces blank if none of the options apply)				
		On the ground	Buildings	Water	Plants	Flying
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4.						
5.						
6.						
7.						
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9.						
10.						
Total						

Number of butterflies: _____ **How many types of butterflies:** _____

Checkpoint: _____ (fill in according to teachers' instructions)

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Butterfly name	Characteristics	Number of visits in each environment by each butterfly within 30 seconds (leave the spaces blank if none of the options apply)				
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Total						

Number of butterflies: _____ **How many types of butterflies:** _____


Checkpoint: _____ (fill in according to teachers' instructions)

Characteristics of this checkpoint: _____

Butterfly name	Characteristics	Number of visits in each environment by each butterfly within 30 seconds (leave the spaces blank if none of the options apply)				
		On the ground	Buildings	Water	Plants	Flying
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7.						
8.						
9.						
10.						
Total						

Number of butterflies: _____ **How many types of butterflies:** _____

Choose up to four species of plants that the butterflies have visited and identify the species of those plants (*hint: try to choose plants that are easy to identify, such as plants that have bloomed or are bearing fruit*):

Plant name	Characteristics	Paste pictures of the plant (if any) or draw the plants
<p>Example</p> <p>Pagoda flower</p>	<p>Heart-shaped leaves and red flowers</p>	
2.		
3.		
4.		
5.		



The field trip is fascinating! I saw many kinds of butterflies, and the scene of those butterflies **flying around the plants** is unforgettable! But what puzzles me is why it is easier to find butterflies near certain types of plants? Are there anything special about those plants?

To understand the relationship between butterflies and plants, we must first understand the dietary habits of butterflies! The images below are a butterfly adult and a butterfly larva. Can you guess what their food sources are from their surrounding environments?



3.1 Food for Butterflies

Draw lines to match the food types with butterflies at different stages.



Adult



Solid food
(e.g. leaves)



Larva



Liquid food
(e.g. nectar)



As the saying goes, “To the people, food is heaven”. The relationship between butterflies and plants is also developed from “eating”. The primary food sources of butterfly adults and larvae both come from plants. We call those plants that provide food for butterflies nectar plants and host plants.

Nectar Plants

- Flowering plants with nectaries that secrete nectar.
- The colour and shape of flowers are usually very eye-catching in order to attract more insects to visit and help spread pollen.
- The nectar secreted is one of the primary food sources for butterfly adults.
- They are highly ornamental and can attract many insects, so they are planted in large numbers in different parks in Hong Kong.



Host plants

- Food for butterfly larvae.
- Butterfly larvae are picky eaters which only feed on specific plants, and therefore larvae of different butterfly species feed on different host plants.
- Butterfly adults lay their eggs on the host plants to ensure that the larvae can get enough food after hatching.



Think over

1. Suppose there is a dense forest in location A, and there are no host and nectar plants in that forest; the size of the forest in location B is less than one-tenth of that in location A, but most of the plants in that forest are host and nectar plants. Where do you think there is a better chance of finding butterflies? Why?
2. "The more types of host plants, the more types of butterflies that are attracted." Do you agree with this statement? Why?



Now share the plants you mentioned on **p. 23** with your teachers to see if they are **nectar plants** or **host plants**!



It turns out that there is such a close relationship between butterflies and plants!

That's right! In addition to butterflies, most insects are inseparable from plants or even the entire environment. When human activities damage the environment, the organisms are indirectly affected, such as losing their spawning and feeding grounds.



Think over

Although it is important to conserve the natural environment, social development cannot be stopped. Can you think of a way to balance between environmental conservation and social development? Which development model can best take care of both issues?





In addition to habitat destruction, some butterflies are also threatened by poaching. Some collectors love common birdwing and golden birdwing because of their eye-catching appearance, making them vulnerable to poaching. This causes their numbers once significantly reduced. Fortunately, common birdwing and golden birdwing are now protected by different laws. They are also the only insects protected by laws in Hong Kong.

Learn more about common birdwing and golden birdwing

The appearances of the common birdwing and golden birdwing are very similar. The difference between the two is that the golden birdwing has a slightly larger body size. Both of their larvae feed on leaves and sprigs of India birthwort, which contains poisonous aristolochic acid. Therefore, both the larvae and adults of common birdwing and golden birdwing are also poisonous, and their brightly-coloured bodies are warning signals for predators.

- **Common birdwing** and **golden birdwing** are protected under the Protection of Endangered Species of Animals and Plants Ordinance (Cap. 586), which prohibits the possession, importing and exporting of their specimens.
- **Common birdwing** is protected under the Wild Animal Protection Ordinance (Cap. 170), which prohibits the capturing and trading of the common birdwing.
- In addition, **India birthwort** is also a protected plant, ensuring that the spawning sites of both butterflies are properly protected.



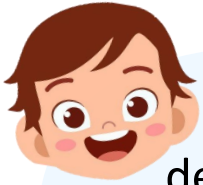
Common birdwing



Golden birdwing



A larva of the common birdwing



After the field trip and lessons, I hope you have developed a deeper understanding of butterflies and even insects.

Insects are important bioresources. They spread pollen for plants, which helps maintain the ecological balance and promote agricultural development; they are consumers and decomposers in the ecosystem, which facilitates nutrient recycling in the natural environment; they also provide us with different products, such as honey and silk, to meet our needs.

However, insects have faced different threats. Human activities and climate change have destroyed their habitats, gradually narrowing their living space.

It takes everyone's efforts to conserve the insects. Are you willing to take action?



My Promise

To conserve the insects and maintain the ecological balance, I'd be happy to _____

_____.