Worksheets

(Caterpillars of Singapore's Butterflies)

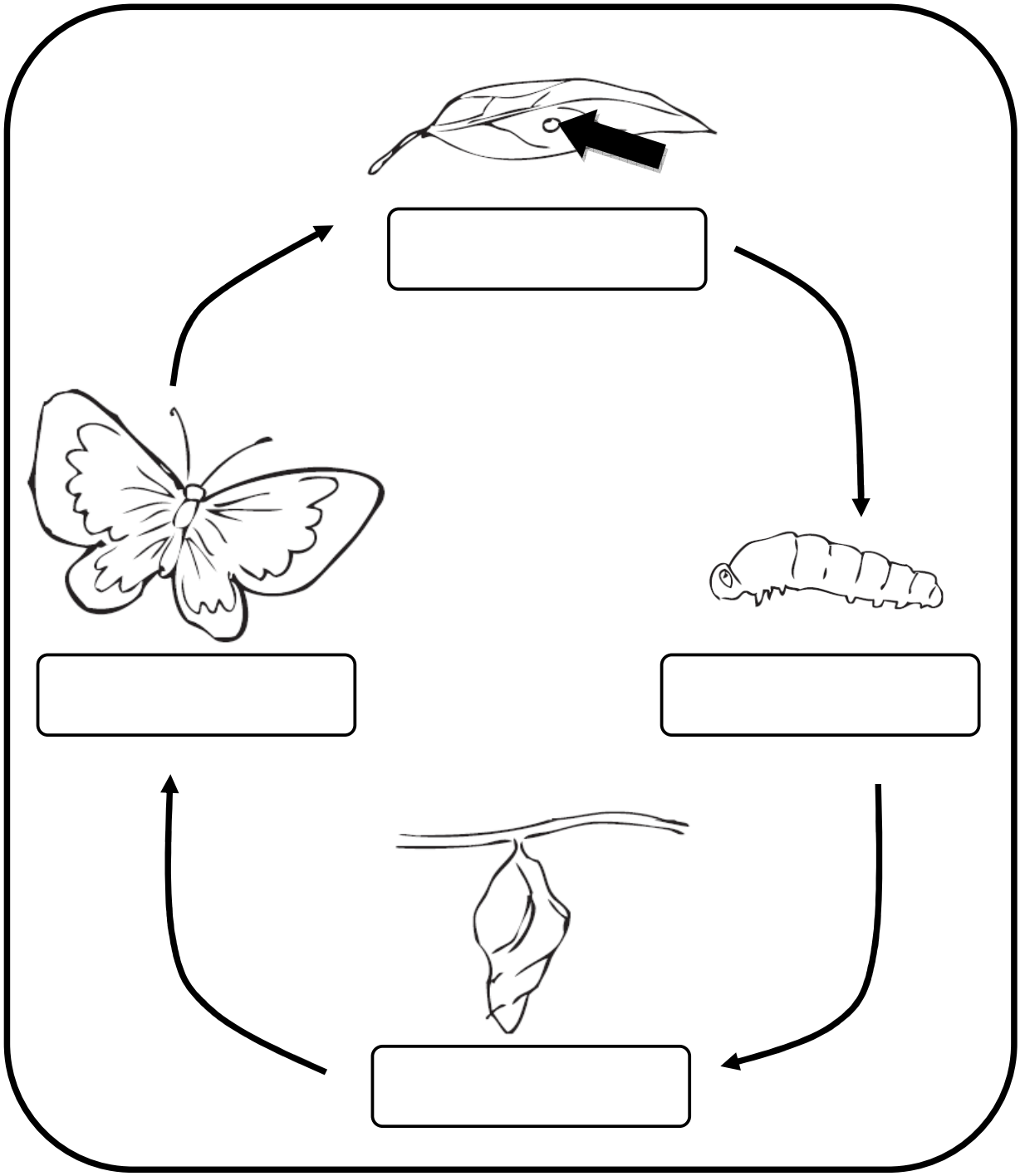
Worksheet	Title	Recommended level
1	Life cycle of a butterfly	P3
2	Am I an insect?	P3
3	Adaptations of the caterpillar – defence mechanism	P6
4	The butterfly and its ecosystem	P6 and lower sec
5	Caterpillar identification	General

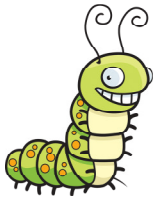
NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

Life cycle of a butterfly

Name: _____ ( ) Class: _____ Date:_____

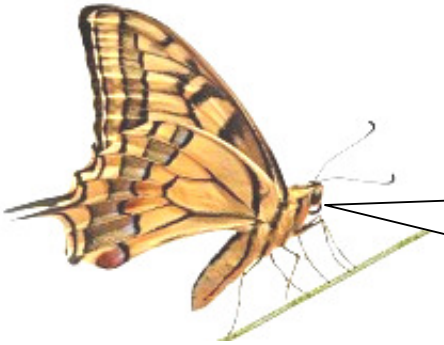
Name the four stages in the life cycle of a butterfly.





Am I an insect?

Name: _____ ( ) Class: _____ Date:_____



An insect has ___ body parts: head, thorax and abdomen.

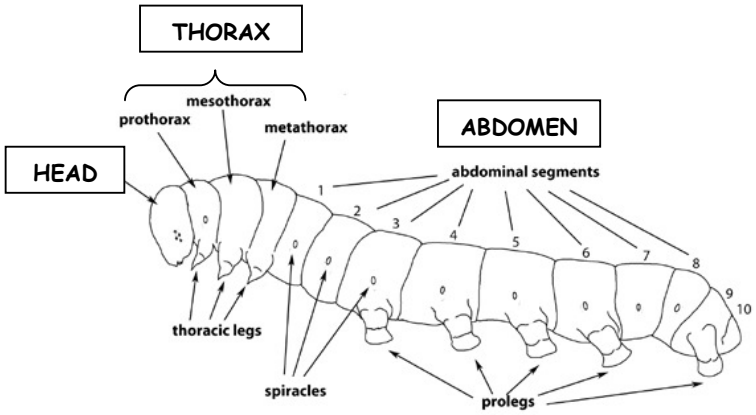
It has __ legs coming out from its thorax.

I have these characteristics, so I am an insect!

I don't look like you, Mummy. What am I? Am I a worm or an insect?

Help the mother butterfly explain to the caterpillar by filling in the blanks with helping words from the box below:

prolegs	real	insect	different	many



My dear caterpillar, you are an _____ like me! You look _____ because it seems that you have _____ legs. But if you look carefully, you will see that you have two different types of legs. Just behind your head (on your thorax) you have 3 pairs of legs which are the real legs. These are called the thoracic legs, and they have joints and small claws at their ends. The other legs which you see at your rear (on your abdomen) are not _____ legs. These are called the _____, and are quite fleshy and have no visible joints.

Adaptations of the caterpillar – defence mechanism

Name: _____ ( ) Class: _____ Date:_____

All butterfly species have defensive mechanisms against predators and parasitoids in both the egg and caterpillar stages. Many predators feed on caterpillars as they are a rich source of protein. As a result, caterpillars have evolved various means of defence.

State whether the following defensive mechanisms are structural or behavioural adaptations (or both) and how these adaptations help the species to survive.

(A) Egg Stage

	Mechanism	Type of adaptation (structural/ behavioural)	How does this adaptation help the species in its survival?
1	The egg takes the same colour as the substrate (or the leaves) that it is laid on, or resembles the plant parts in the vicinity.		
2	The mother butterfly lays the egg in a tight space between leaves or flower buds within a gelatinous matrix, or in a mess of hair that is glued to the egg.		
3	The mother butterfly lays eggs in clusters.		
4	The mother butterfly stands guard over its cluster of eggs for days until they hatch.		

(B) Caterpillar Stage

Mechanism		Type of adaptation (structural/ behavioral)	How does this adaptation help the species in its survival?
1	The caterpillar feeds on plants with toxic chemicals and stores these toxins in its body. The caterpillar is unaffected by the toxins, but a predator will be poisoned if it eats the caterpillar.		
2	The caterpillar has patterns or prominent spines which warn predators of its toxicity.		
3	The caterpillar constructs a leaf shelter in which to rest in-between feeds.		
4	The caterpillar forcefully catapults its frass pellets (waste) away from its resting or feeding site.		
5	The caterpillar produces brightly-coloured structures on its body (by turning out specialised glands), and emits a strong scent when a predator appears.		

6	The caterpillar possesses nectary glands that attract the attendance of ants.		
7	The caterpillar's body colour and markings match the plant part it is feeding or resting on (such as thorns). It can even mimic objects in the environment, such as bird droppings.		

The Caterpillar and its impact on the ecosystem

Name: _____ ( ) Class: _____ Date:_____

Case Study:

When the population of Caterpillar Species X suddenly increases in Forest A, the birds that feed on the caterpillar are affected. For instance, the increased population of caterpillars may heavily defoliate the trees on which they live, in turn exposing any bird nests that are located on the trees. The defoliation may also affect the temperature and humidity of the forest.

(a) Explain how the population of birds will be positively affected by the increase in the number of Caterpillar Species X.

_____

_____

(b) Explain how the population of birds will be negatively affected by the increase in the number of Caterpillar Species X.

_____

_____

(c) How do you think the temperature and humidity of the forest may be affected when the trees are heavily defoliated? Will this impact the animals in the forest?

_____

_____

Caterpillar identification

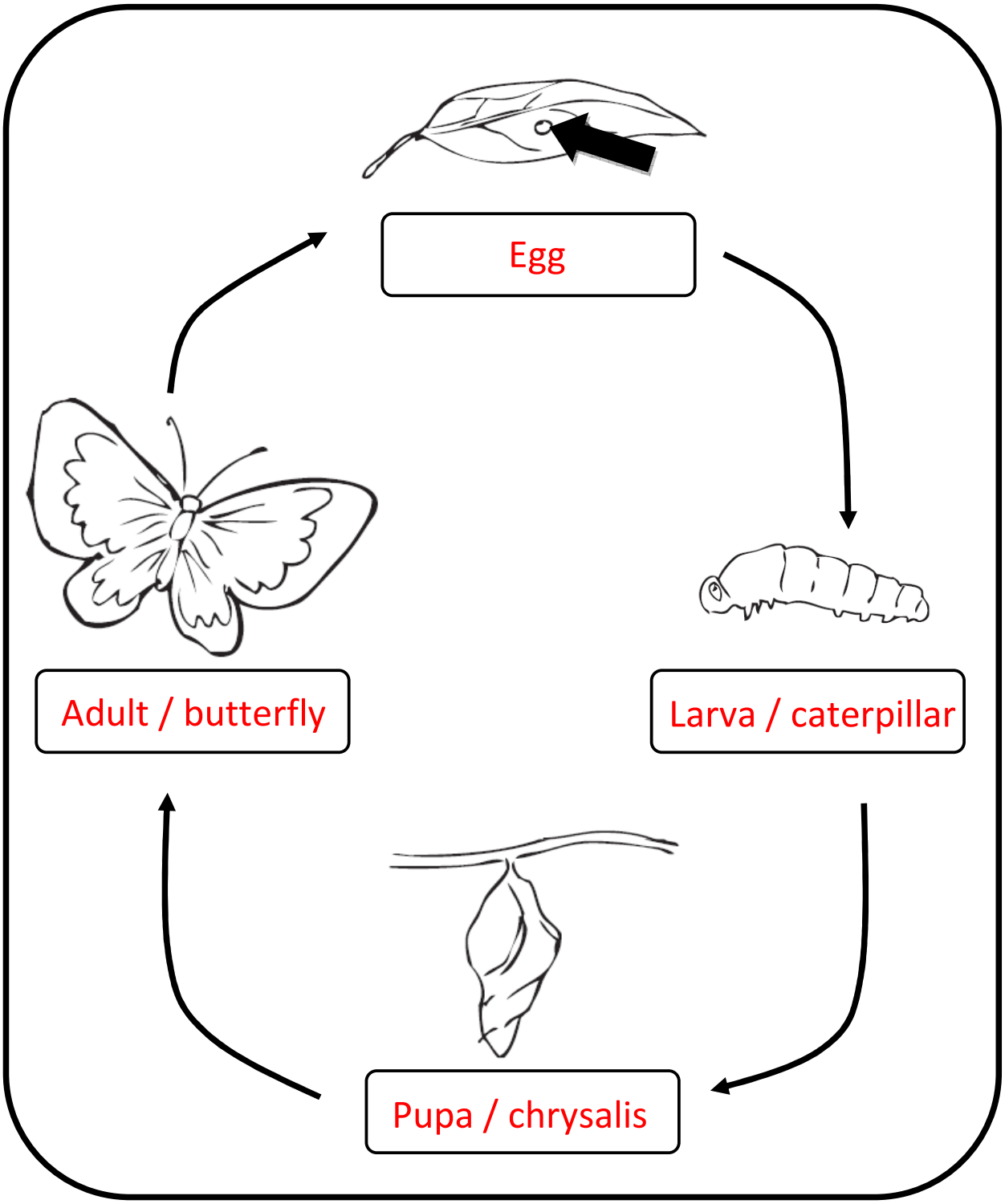
Name: _____ ( ) Class: _____ Date:_____

Have fun matching these caterpillars to their names!

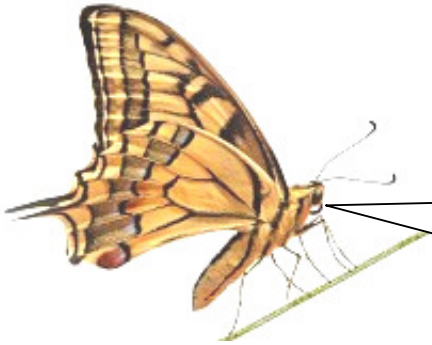
Plain Nawab	•	•	
Blue Spotted Crow	•	•	
Lime Butterfly	•	•	
Plain Tiger	•	•	
Painted Jezebel	•	•	
Chocolate Pansy	•	•	
Common Birdwing	•	•	

NATIONAL PARKS | LET'S MAKE SINGAPORE OUR GARDEN

Life cycle of a butterfly



Am I an insect?



An insect has _3__ body parts: head, thorax and abdomen.

It has _6_ legs coming out from its thorax.

I have these characteristics, so I am an insect!

I don't look like you, Mummy. What am I? Am I a worm or an insect?

Help the mummy butterfly explain to the caterpillar by filling in the blanks with the helping words from the box below:

prolegs	real	insect	different	many

My dear caterpillar, you are an ___insect_ like me! You look _different because it seems that you have __many__ legs. But if you look carefully, you will see that you have two different types of legs. Just behind your head (on your thorax), you have 3 pairs of legs which are your real legs. These are called the thoracic legs, and they have joints and small claws at their ends. The other legs which you see at your rear (on your abdomen) are not ___real__ legs. These are called the __prolegs__, and are quite fleshy and have no visible joints.

Adaptations of the Caterpillar – defence mechanism

(A) Egg Stage

	Mechanism	Type of adaptation (structural/ behavioural)	How does this adaptation help the species in its survival?
1	The egg takes the same colour as the substrate (or the leaves) that it is laid on, or resembles the plant parts in the vicinity.	Structural	This helps the egg to blend into the background/provides **camouflage** to prevent it from being seen by any predators.
2	The mother butterfly lays the egg in a tight space between leaves or flower buds in a gelatinous matrix or in a mess of hair that is glued to the egg.	Behavioural	This helps the egg to be **physically concealed**/hidden from the sight of predators so that it will not be eaten.
3	The mother butterfly lays eggs in clusters.	Behavioural	This helps to **ensure the survival** of **some of the eggs** at the sacrifice of the rest to parasitoids (parasites that kill the host).
4	The mother butterfly stands guard over its cluster of eggs for days until they hatch.	Behavioural	This helps to **deter smaller predators** (insects like ants or parasitoid wasps) from removing/eating the eggs.

(B) Caterpillar Stage

	Mechanism	Type of adaptation (Structural/ Behavioural)?	How does this adaptation help the species in its survival?
1	The caterpillar feeds on plants with toxic chemicals and stores these toxins in its body. The caterpillar is unaffected by the toxins, but a predator will be poisoned if it eats the caterpillar.	Behavioural	Predators will avoid eating these toxic caterpillars.
2	The caterpillar has patterns or prominent spines which warn predators of its toxicity.	Structural	Predators will avoid eating prey which displays warning colouration or structures.
3	The caterpillar constructs a leaf shelter in which to rest in-between feeds.	Behavioural	The caterpillar retreats/hides in the shelter to avoid being seen when a predator appears.
4	The caterpillar forcefully catapults its frass pellets (waste) away from its resting or feeding site.	Behavioural	TThe chemical signature of the caterpillar is in the frass; by throwing the waste away, predators are distracted from attacking the caterpillar.
5	The caterpillar produces brightly-coloured structures on its body (by turning out specialised glands), and emits	Behavioural and structural	This adaptation scares/confuses predators and deters them from eating the

	a strong scent when a predator appears.		caterpillar.
6	The caterpillar possesses nectary glands that attract the attendance of ants.	Behavioural and structural	The presence of ants serves to deter predators and parasitoids from coming to the site.
7	The caterpillar's body colour and markings match the plant part it is feeding or resting on (such as thorns). It can even mimic objects in the environment such as bird droppings.	Structural	This helps the caterpillar blend into the background/provides camouflage to avoid detection by predators.

The Caterpillar and its impact on the ecosystem

(a) Explain how the population of birds will be positively affected by the increase in the number of Caterpillar Species X.

Ans: The Caterpillar Species X is the food source of the birds, so when the population increases, the bird population will be better sustained."

(b) Explain how the population of birds will be negatively affected by the increase in the number of Caterpillar Species X.

Ans: With the increase in the number of the Caterpillar Species X, trees will be heavily defoliated. Heavy defoliation of trees and shrubs removes the protective cover of tree leaves; nests that normally are hidden by leaves are then exposed and more visible to predators.

(c) How do you think the temperature and humidity of the forest may be affected when the trees are heavily defoliated? Will this cause an impact to the animals in the forest?

Ans: Defoliation removes the leaves of the tree. With fewer leaves, the humidity of the forest is decreased during the day (because there is less evapotranspiration), and the temperature is increased (because of reduced shading). These changes to the microclimate will likely cause impacts to the animals in the forest; for example, possibly reducing the survival of young birds.

Source: http://www.dnr.state.mn.us/treecare/forest_health/ftc/impacts.html

Caterpillar identification

Lime Butterfly	
Common Birdwing	
Painted Jezebel	
Blue Spotted Crow	
Chocolate Pansy	
Plain Nawab	
Plain Tiger