ADELAIDE ZOO
adelaidezoo.com.au

# Adaptations

SECONDARY

ZOOS SOUTH AUSTRALIA
zoossa.com.au

Government of South Australia
Department for Education and Child Development

## Acknowledgements

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This Outreach Education program for schools is a partnership between Zoos SA and the Department for Education and Child Development, South Australia. Outreach Education is a team of seconded teachers based in public institutions who are managed through the DECD Teaching and Learning.

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# For the Teacher

# General Information

Welcome to Adelaide Zoo!

The Zoo is a great place for learning. The Adelaide Zoo Learning team aim to support student learning by providing resources to assist classes to have educational and enjoyable experiences at the Zoo.

This booklet will provide a range of activities which may be undertaken by your students during their visit to the Zoo. A map and suggested order of activities is provided to give a logical circuit to travel during the visit.

Animal species change from time to time, and sometimes animals are “off limits” or out of sight during visits, so a flexible approach to completion of activities is recommended.

In planning, please consider whether

- you would like your class to regroup for lunch, animal feeds, the Discovery Zone or at the Entrance at the end of the visit. If so, relay the times and meeting places to students or supervisors (in writing if possible.)
- you would like to see use the Nocturnal House: if so, book a time when making the Zoo booking so your students are not disturbed by other school groups.
- you would like a Zoo Focus Day Program with a Zoo Education Officer to support your study theme. The 45 minute interactive sessions need to be booked when you make your class booking.

If your class is not booked in to a program involving an Education Officer, we will attempt to meet your class at the Entrance on arrival at the Zoo. At this meeting the group will be welcomed and given some information about the Zoo to assist their visit. General behaviour expectations will also be outlined.

Specific information relating to this Zoo Trail will follow for the teachers and for adult supervisors. Please ensure that supervisors have a copy of the relevant pages **before they come to the Zoo** so they can also be mentally prepared to maximise the learning for the students in their care.

# Adaptations – Secondary

# TEACHER INFORMATION

This trail includes studies on 5 species of animals. These are:

Australian Sealion – structural adaptations
Meerkat – behavioural adaptations
A desert snake – physiological adaptations
Cassowary – various adaptations
Giant Panda – various adaptations

There is also a "Camouflage Spotto" which students can complete during the day using a variety of species.

The activities are discrete, so teachers should feel free to delete activities from the selection is concerned about time available. The first 3 activities listed above are recommended, to emphasise the different types of adaptations that occur.

Students are encouraged to work in groups, to discuss their ideas, to use careful observations of animals and their habitat enclosures, to read signage for information on distribution and habitats of the animals and to ask questions if Zoo keeping staff are available.

<u>Pre-visit ideas</u>

- Research an animal species. Find out about its natural habitats, predators, food courses and the adaptations it has to help it survive.
- Make a list of all the adaptations humans have, compared to orangutans for example, and how they improve our chances of surviving in our environment.
- Consider trading places with a chimpanzee in the wild, and consider adaptations we would need to be able to survive.
- Group animals into the habitats that they come from, then compare adaptations that they have – looking for similarities and differences.
- Write one day of the diary of a chosen animal which is living in the wild. The writing should show how it uses its various adaptations to survive everyday life.
- Explore the connections between inheritance of characteristics, variation in populations, the struggle for survival and adaptations of a species.
- Explore the pressure of a changing environment on adaptations of species, and the idea of evolution and extinction.
- Research disease resistance in terms of adaptations and evolutions in disease-causing microorganisms.
- The following words and terms would be useful as prior knowledge to your visit to the Zoo:

  Adaptation
  Environment
  Habitat
  Nocturnal, diurnal and crepuscular (active at dusk and dawn)
  Threatened species.

Post-visit ideas

- Choose an animal to study in terms of its place in its ecosystem and adaptations that help it to survive and reproduce. Findings could be presented in a report, poster or pamphlet.
- Choose a species which is a “Threatened Species” and research reasons why it is now facing extinction despite all the adaptations which have helped it to survive thousands of generations.
- Compare and contrast adaptations of similar animal species from different habitats. For example:

    Polar Bear vs Giant Panda

    Arctic Fox vs Fennec Fox

    African Elephant vs Asian Elephant

    Cassowary vs Emu

# Links to the Australian Curriculum

**Science Understanding (Biological Sciences)**

**Yr 8**
Multi-cellular organisms contain systems of organs that carry out specialiased functions that enable them to survive and reproduce (ACSSU150)

**Yr 9**
Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175)

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems.

**Yr 10**
The transmission of heritable characteristics from one generation to the next involves DNA and genes (ACSSU184)

The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (ACSSU185)

**Science as a Human Endeavour (Nature and development of science)**

**Yr 8**

People use understanding and skills from across the disciplines of science in their occupations (ACSHE227)

# Background notes for teachers and students on the day

This trail is designed for students to work in pars or in small groups.

Students will study 5 particular species during the day which are:

- Australian Sealion
- Meerkats
- A snake species
- Giant Panda
- Cassowary

They will also identify a number of other animals which they see during the day which are camouflaged in a particular way.

Students should read the background information at the start of the trail, then use the Zoo map to move around the Zoo to study the animals.

The oder that animals re studied in does not matter.

Students are encouraged to discuss their ideas with their group, to use their observation skills, to read the signs and to talk to Zoo staff.

**Key**

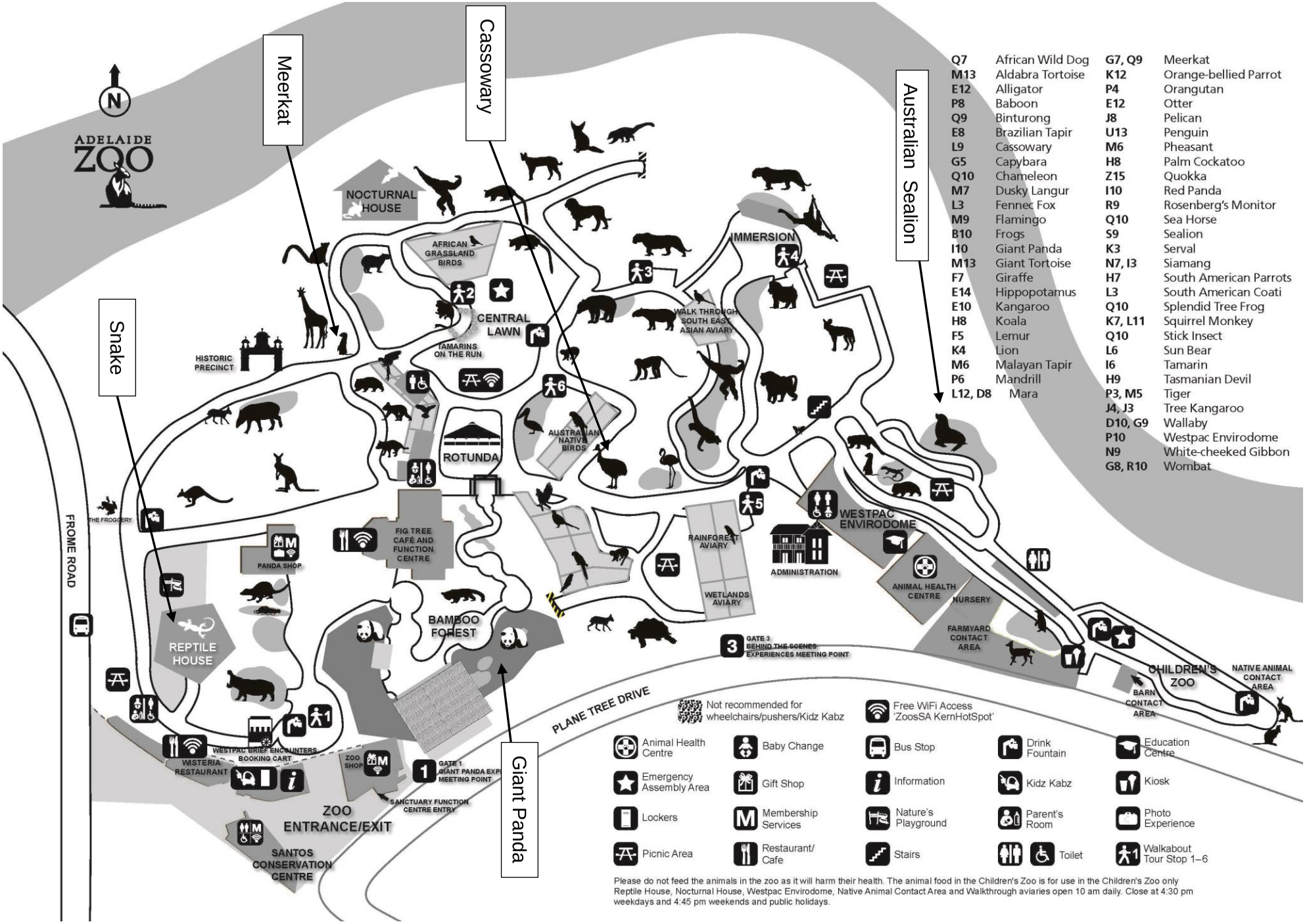
Observe carefully

Discuss and share ideas with your group

Write down your thoughts

Challenge question

? Did you know?


ADELAIDE ZOO
N
Meerkat
Cassowary
Snake
Giant Panda
Australian Sealion
NOCTURNAL HOUSE
AFRICAN GRASSLAND BIRDS
CENTRAL LAWN
TAMARINS ON THE RUN
HISTORIC PRECINCT
IMMERSION
WALK THROUGH SOUTH EAST ASIAN AVIARY
AUSTRALIAN NATIVE BIRDS
ROTUNDA
THE FROGGERY
PANDA SHOP
FIG TREE CAFÉ AND FUNCTION CENTRE
RAINFOREST AVIARY
WETLANDS AVIARY
ADMINISTRATION
WESTPAC ENVIRODOME
ANIMAL HEALTH CENTRE
NURSERY
FARMYARD CONTACT AREA
BAMBOO FOREST
REPTILE HOUSE
GATE 3 BEHIND THE SCENES EXPERIENCES MEETING POINT
CHILDREN'S ZOO
BARN CONTACT AREA
NATIVE ANIMAL CONTACT AREA
FROME ROAD
PLANE TREE DRIVE
WESTPAC BRIEF ENCOUNTERS BOOKING CART
WISTERIA RESTAURANT
ZOO SHOP
GATE 1 GIANT PANDA EXP MEETING POINT
SANCTUARY FUNCTION CENTRE ENTRY
ZOO ENTRANCE/EXIT
SANTOS CONSERVATION CENTRE
Q7 African Wild Dog
M13 Aldabra Tortoise
E12 Alligator
P8 Baboon
Q9 Binturong
E8 Brazilian Tapir
L9 Cassowary
G5 Capybara
Q10 Chameleon
M7 Dusky Langur
L3 Fennec Fox
M9 Flamingo
B10 Frogs
I10 Giant Panda
M13 Giant Tortoise
F7 Giraffe
E14 Hippopotamus
E10 Kangaroo
H8 Koala
F5 Lemur
K4 Lion
M6 Malayan Tapir
P6 Mandrill
L12, D8 Mara
G7, Q9 Meerkat
K12 Orange-bellied Parrot
P4 Orangutan
E12 Otter
J8 Pelican
U13 Penguin
M6 Pheasant
H8 Palm Cockatoo
Z15 Quokka
I10 Red Panda
R9 Rosenberg's Monitor
Q10 Sea Horse
S9 Sealion
K3 Serval
N7, I3 Siamang
H7 South American Parrots
L3 South American Coati
Q10 Splendid Tree Frog
K7, L11 Squirrel Monkey
Q10 Stick Insect
L6 Sun Bear
I6 Tamarin
H9 Tasmanian Devil
P3, M5 Tiger
J4, J3 Tree Kangaroo
D10, G9 Wallaby
P10 Westpac Envirodome
N9 White-cheeked Gibbon
G8, R10 Wombat
Not recommended for wheelchairs/pushers/Kidz Kabz
Free WiFi Access 'ZoosSA KernHotSpot'
Animal Health Centre
Baby Change
Bus Stop
Drink Fountain
Education Centre
Emergency Assembly Area
Gift Shop
Information
Kidz Kabz
Kiosk
Lockers
Membership Services
Nature's Playground
Parent's Room
Photo Experience
Picnic Area
Restaurant/ Cafe
Stairs
Toilet
Walkabout Tour Stop 1–6
Please do not feed the animals in the zoo as it will harm their health. The animal food in the Children's Zoo is for use in the Children's Zoo only
Reptile House, Nocturnal House, Westpac Envirodome, Native Animal Contact Area and Walkthrough aviaries open 10 am daily. Close at 4:30 pm
weekdays and 4:45 pm weekends and public holidays.

# ADAPTATIONS

## A STRUGGLE FOR SURVIVAL…..

?

Living in the wild is a risky business. For all species, most of the animals that are born do **not** survive to adulthood.

How do they die?

- Eaten by predators
- Starvation – not able to find or catch enough food
- Drought , flood, extreme temperatures, fire, natural disasters
- Unable to find a suitable shelter
- Diseases and parasites etc..

Animals that are alive in the world today have been born to a long line of SURVIVORS AGAINST THE ODDS. How did they succeed where so many others failed?

All living things have adaptations which help them to survive and to reproduce in their particular habitat. Being well adapted does not guarantee survival, but it increases the chances.

Most adaptations can be described in one of 3 ways:

- **Structural** or Physical adaptations, where some part of the body is built differently. Eg. Large ears to assist heat loss, thick spiny hairs to protect against predators.
- **Physiological** or Body functioning adaptations, where the organism functions differently. Eg. Ability of some desert mammals to tolerate a much higher body temperature than most mammals could survive.
- **Behavioural** adaptations, where particular activities assist survival. Eg. nocturnal lifestyle, herd animals living in groups with many eyes and ears alert for predators.

# AUSTRALIAN SEALION
## Structural adaptations

Observe the Australian sealions in their day enclosure.

As in the wild, they spend enormous amounts of time swimming in salt water.

Discuss how hard it would be for **you** to live in the Southern Ocean, for most of the daylight hours of your life, eating fish and other sea animals.

What are some of the factors which would make it impossible for humans to survive this lifestyle?

- _____
- _____
- _____
- _____
- _____
- _____

Look for structural adaptations of the Australian sealions that would improve their chances of survival in the wild.

Describe and draw 3 of these features as accurately as you can.

Write a sentence about how each one helps it to survive.

Feature 1_____

_____

_____

_____

_____

Feature 2_____

_____

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_____

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Feature 3_____

_____

_____

_____

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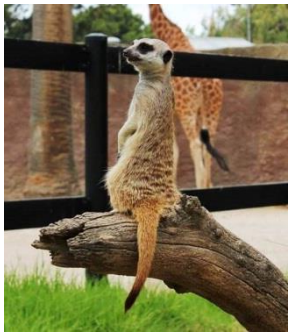


# MEERKATS
## Behavioural adaptations

?

- Meerkats are “group-living” animals, living in desert regions of Africa in groups (a mob, gang or clan) of up to 30 individuals.
- Only one pair in the clan breed: this pair is called the **alpha** male and female. Members of the clan fight when the group is first established to decide which Meerkats are the most dominant and strongest – these will be the alpha pair.
- When the alpha female produces a litter (up to 4 pups), all members of the clan help to feed and care for them. Females that have never produced offspring often lactate to feed the alpha pair’s young and also babysit them.
- When the adults have collected food (insects, lizards, snakes, scorpions, spiders, eggs, small mammals, millipedes, centipedes and small birds), they return to the burrows to feed the young that have been left safely at ‘home’!.
- Meerkats forage for food in a group with one or more standing ‘sentry’, on guard watching for predators. They will vocalise to warn the others of any pending danger.
- Vocalisations can not only indicate that there is danger, but the acoustic characteristics of the call can express the urgency of danger and whether the predator is aerial or terrestrial.

Observe the Meerkats.

Can you determine how Meerkats can successfully kill and eat a highly venomous scorpion? Think about the necessary adaptations for such a task. How would young Meerkats learn this skill?

Predict what would happen if all males and females in a clan were able to breed.

Fighting can cause injuries which may cause an animal to get infections and perhaps even to die.

How could fighting for the right to breed be a behavioural adaptation?

**Challenge question**

**Can you predict the difference between Meerkat behaviours upon hearing an urgent, terrestrial predator call and an urgent aerial predator call from the sentry?**

# CAMOUFLAGE SPOTTO
## To be filled in at various Zoo locations

?

Many animals use colour to help them to hide – from predators or prey.

Some types of camouflage are:

- **Blending** where the animal, if still, blends into the background and becomes "invisible" – eg. The African wild dog.
- **Disruptive** where the outline of the animal's shape is broken up by spots or stripes. – eg. The Yellow-footed rock-wallaby.
- **Counter shading** especially for swimming animals, where the upper surface is dark and the lower surface is light. - eg. Many ocean fish. From above it blends into the dark ocean depths, from below it blends into the glary ocean surface.
- **Mimicry** – where the colourings of an animal, combined with its shape, make it resemble something else: eg. A harmless snake coloured the same as a deadly one, or an insect which looks like a leaf.



As you move around the Zoo, fill in the table below for some animals in which camouflage is a very important adaptation.

| Type of camouflage | Name of species | Description of colouring |
|---|---|---|
| **Blending** | | |
| **Blending** | | |
| **Blending** | | |
| **Disruptive** | | |
| **Disruptive** | | |
| **Disruptive** | | |
| **Counter shading** | | |
| **Mimicry** | | |

# SNAKE
# Physiological Adaptations

?

Reptiles are very different physiologically from mammals:

**Body temperature**

Mammals use much of the food they eat (about 80%!!) to produce heat inside their bodies and to keep their core temperature constant. They are commonly called warm-blooded, but a better term is **endothermic** – meaning heated from within.

Reptiles are solar heated! They do not use food for generating heat: instead they absorb heat from their surroundings eg. By basking in the sun. They are **ectothermic –** heated from outside their bodies. It is not true to say they are cold-blooded, as this is only the case in cold weather. In warm weather they are warm-blooded! Reptiles cannot move quickly when their internal body temperature is cold.

**Waste removal**

Kidneys are important organs which remove wastes from the blood.

In mammals, this waste is mostly **urea** and this needs to be removed by dissolving it in large amounts of water. This mixture is called **urine** and is commonly 98% water.

Reptiles from dry areas produce the waste **uric acid**. This can be removed in a mixture with only a small amount of water. This waste looks like white paste.

In the Reptile House observe and describe a snake which originates in a desert environment.

Name of the snake_____

Short description_____

_____

As in all habitats, snakes of the desert are eaten by a variety of predators including carnivorous mammals, reptiles and birds of prey. It's dangerous leaving home!

Explain the advantages and disadvantages of being ectothermic like a reptile.

advantages_____

_____

disadvantages_____

_____

Would you expect to find more reptile species in the Northern Queensland rainforests or Tasmanian rainforests? Explain your answer.

_____

_____

Explain why excreting wastes by producing uric acid is a useful physiological adaptation for desert species of reptiles.

_____

_____

# CASSOWARY
## An impressive bird !

Carefully observe the Cassowary's feet.

Draw one foot, as accurately as possible, in the space here.

?

Adult Cassowaries have few natural predators, but their chicks are attractive food for a number of natural and introduced predators.

The Cassowary male protects and sits on the eggs, which were laid by the female, until they hatch. He then raises the young until they are fully-grown and independent.

Predict what would happen if you were in a tropical rainforest in Queensland or New Guinea, and you walked between a father Cassowary and his chicks.

Discuss reasons why the unusual "sole parenting" role of male Emus and Cassowaries could be an adaptation. ie. How could it help the **species** to survive?

Write down your ideas

Notice the "helmet" of the Cassowary.

How could this feature be a structural adaptation for this rainforest animal?

Most mammals do not have colour vision – they see in shades of grey.

Birds do have good colour vision.

How could these aspects of the Cassowary's colouring be adaptations?

a) Black feathers over most of the body

b) Bright red, white and blue skin showing on the neck?

# GIANT PANDA

## A very unusual bear!

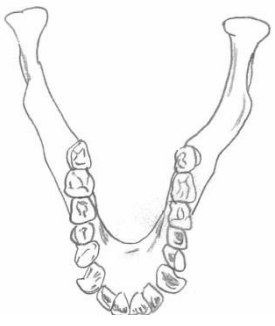
Observe a Giant Panda in its exhibit.

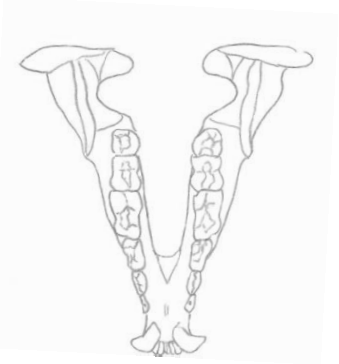
Sketch the Panda in the space below, showing the areas of dark and white colour. Label any significant body parts you can see like teeth, claws, eyes etc.

Pandas have a mainly vegetable (bamboo) diet. Yet being Bears, they are classed as "carnivores", and their ancestors were largely carnivorous.

Try to correctly label the 4 lower jaw diagrams below with the correct mammal species.

Choices are: Lion, Zebra, Giant Panda and Chimpanzee. (drawn to different scales)





_____ _____ _____ _____

Give reasons for your choice of the Giant Panda jaw.

Giant Pandas have amazing colouration, which you would expect to be clearly seen in the dark green mountain forests of their natural habitat.

In the winter, with a lot of snow around, would their colouring be an adaptation?

Explain your answer.

Observe the hand of a Giant Panda if possible.

You may notice a “thumb” which is used to help grasp bamboo shoots and other things. But if you count the clawed toes, you will find **five** toes **plus** the “thumb”!

The thumb is actually formed by a greatly extended wrist bone.

Explain why you think that Giant Pandas are the only bear species with this structural adaptation.

**Challenge question**

**Consider a population of seed-eating birds which are very well adapted to their grassland habitat on a large island.**

**Imagine that the climate changes so that over a century the island becomes much wetter, with a forest, rivers and lakes becoming established.**

**Discuss how the adaptations of the population may change in terms of the**

- **The struggle for survival,**
- **Offspring being similar to parents and each other, but not identical,**
- **The chances of different offspring surviving to reach reproductive age.**

Write down your ideas.