3. Continuation of species has resulted, in part, from the reproductive adaptations that have evolved in Australian plants and animals

Students learn to:

- **distinguish between the processes of meiosis and mitosis in terms of the daughter cells produced**

To grow and repair dead or damaged cells many cells within an organism must divide and multiply by normal cell division called mitosis. After mitosis all of the daughter cells are genetically identical to the parent cell (unless a genetic mutation has occurred during the division). A few multicellular organisms can use normal cell division as a form of reproduction; some new plants can "bud" off the mother plant, fungi can sometimes reproduce by using spores, a few simple worms can divide in two to multiply. (We can cheat by growing some plants from cuttings or grafts so that all of the offspring are genetically identical to the parent and will produce identical fruit or roses etc)

Meiosis on the other hand produces gamete cells (= sperm or ova or pollen or ovules) that combine during fertilization to for a new cell that is genetically different to either parent.

MITOSIS	MEIOSIS

- **compare and contrast external and internal fertilisation**

	EXTERNAL FERTILISATION	INTERNAL FERTILISATION
Compare		
Contrast		

- **discuss the relative success of these forms of fertilisation in relation to the colonisation of terrestrial and aquatic environments**

(This dot point includes some concepts that were in a topic called "Living on land and living in water" that was in the Bio Syllabus in the 1990s. It is also covered in detail in some older textbooks. Mr D)

	EXTERNAL FERTILISATION	**INTERNAL FERTILISATION**
AQUATIC (= in water)		
TERRESTRIAL (= on land)		

- **describe some mechanisms found in Australian flora for:**

– pollination (= when pollen lands on the flower stigma Mr D)

Australia does not have distinct seasons and so it is not essential that plants all flower in spring. There is actually an advantage if a plant can flower at another time of the year as it is more likely to have animals carry its pollen to the same species of plant and so increase the chance of crosspollination (= when pollen from another plant pollinates a flower it gives more genetic variation than if the flower is self pollinated) . Most wattles (= have small yellow fur-ball flowers) and Boronias (= small bush plant with four pink petals that form as a square pyramid and then open) flower in winter in Sydney. Some Eucalypts (= gum trees) flower in Autumn.

Most grasses are wind pollinated (= the pollen is carried by wind) and so do not have "showy" flowers to attract insects, birds or mammals.

Flowering plants are mostly cross pollinated by insects, birds or mammals and so must offer the animals nectar, or pollen or scent or flowers to attract them.
Eucalypts have flowers with hundreds of stamens and with nectar to attract birds and insects. Some of the pollen rubs off onto the animal and is carried to the next flower with a chance of crosspollinating it.

Red flowers such as waratahs (= NSW state flower; large bright red multiple flower) are often bird crosspollinated because insects do not see red well. Bees are more attracted by yellow or blue flowers. Some yellow flowers also reflect ultra violet light, which bees do detect.

Strongly scented flowers attract insects, and some mammals. Large Fruit bats (= large bats that we sometimes see flying over Turramurra at sunset are called "flying foxes" in Australia because their face looks like a fox; but they are really just large fruit bats; they do lots of damage to orchards; we do have some tiny insect eating bats that can locate their food by sending out high "beeps" and listening for the echo with huge ears. Fruit bats look much nicer because they don't have funny large ears but they do carry a very dangerous virus so do not pick up an injured one) are attracted by sweet smelling flowers that open at night. Some rainforest trees are bat pollinated as light levels are low and so flower colours are not easily seen. A few flowers have a rotten smell to attract flies.

The link between some plants and their crosspollinators is so tight that they are totally dependant on each other; if one becomes extinct then so will the other.
A few flowers (mostly orchids) mimic the look or pheromone (= sexy smell) smell of insects to attract crosspollinators who try to "mate" with the flower and spread pollen.

– seed dispersal

Fruits attract animals to eat them and carry seeds away from the parent and "drop" the indigestible seeds in a pile of manure.
Eucalypts produce millions of seeds in the "hope" that a few will fall far enough from the parent and germinate.

In Bushfire areas Banksias, Hakeas and woody pears produce seeds that are protected by a thick woody seedpod that does not burn during bush fires. After the fire the seedpod dries out and opens, dropping the seeds when there is less competition.

– asexual reproduction

A few Australian plants are known to grow asexually. Some mallee (= multiple stem) gum trees grow as new shoots from the one root ball. In WA a clump of gum trees was found to be genetically identical, implying that they have reproduced asexually. The Wollomi Pine recently discovered 150km northwest of Sydney has very little genetic variation, even the trees in two separate valleys; maybe they have all grown from one parent asexually?

Many imported weeds can reproduce asexually eg privet, wandering dew, blackberry, (= weeds in Lane Cove National Park) coral trees and willows. Not only must the tree be cut down, but all roots and stems must be destroyed to kill the plant. This is why eradification is so difficult.

with reference to local examples

- **describe some mechanisms found in Australian fauna to ensure**

– fertilisation

Most species of organisms have adaptations that increase the chances of fertilisation. In herd mammals such as kangaroos, fights between the dominant males, ensures that the strongest father most of the joeys.

In many mammals the females only ovulate when the food supply has sufficient protein quality to sustain the mother during pregnancy. Unfortunately rabbits, one of our worst feral pests also uses this tactic and so more survive droughts so that they can breed up very quickly when conditions do improve. Others are only receptive to the males ("on heat") at the time of ovulation and the males are only interested at this time.

– survival of the embryo and of the young after birth

Some desert species of kangaroos, particularly the red kangaroos can stop the development of the embryo during drought and restart the development when rains come. The development is also stopped if the mother has a joey in the pouch suckling milk. When the joey leaves (or dies) the pregnancy restarts. This is called "embrionic diapause".

- **explain how the evolution of these reproductive adaptations has increased the chances of continuity of the species in the Australian environment**

All of the tactics explained above have come about by mutations that have accidently given some members of their species an advantage, they have survived better and passed on those mutations to their offspring. In central and northern Australia where the rainfall is very irregular the environment has selected the animals that can control their breeding to match the environment.

Budgerigars are one of the most common birds in central Australia. They do not have a true breeding "season" each year. If there is rain they breed and keep breeding until the water holes and creeks dry up and then stop breeding and the survivors hold on till the next rains that are months or even years away.

- **describe the conditions under which asexual reproduction is advantageous, with reference to specific Australian examples**

When conditions remain constant over many thousands of years asexual reproduction might be an advantage because it can produce more offspring that are identical to the parent e.g. Wollomi Pine

Students:

- **analyse information from secondary sources to tabulate the differences that distinguish the processes of mitosis and meiosis**

MITOSIS	MEIOSIS

- **identify data sources, gather, process and analyse information from secondary sources and use available evidence to discuss the relative success of internal and external fertilisation in relation to the colonisation of terrestrial and aquatic environments**

	EXTERNAL FERTILISATION	INTERNAL FERTILISATION
AQUATIC (= in water)		
TERRESTRIAL (= on land)		

- **plan, choose equipment or resources and perform a first-hand investigation to gather and present information about flowers of native species of angiosperms to identify features that may be adaptations for wind and insect/bird/mammal pollination**

(This was an assessment task given for this topic)

ASSESSMENT TASK VALUE DATE DUE

In Biology you have to complete "open ended" investigations. For this ASSESSMENT TASK you have to determine the likely method of pollination for at least FIVE and up to SEVEN different species of native plant (you will not lose marks if you have one or two imported plants but try to get native plants; if you are not sure bring a flower in to ask your teacher but DO NOT pick flowers in a National Park) near your home. We expect you to use a range of plants from different groups: if you studied 5 types of wattle tree your answers would most likely all be the same.

For EACH type of flower we expect:

- at least its common or Biological name
- an accurate longitudinal section drawing of the flower, with labelling
- description of any nectar or scent
- description of how pollen appears to be released when the flower is on tree
- description of ALL animals landing on the flower during observations. If possible trap any insects and use a hand lens to look for pollen. For birds or mammals use binoculars to observe behaviour and look for pollen
- final conclusions as to method of cross-pollination for each type of flower