Make your own Tardigrade

The purpose of this practical work is:

* to examine how characteristics are inherited
* to show one of the ways in which meiosis is responsible for the tremendous variation in offspring in any species that reproduces sexually
* to learn about Tardigrades and how they can survive in extreme environments

Equipment:

* + - * Print out of meiosis sheets
			* Envelopes
			* Rulers
			* Plasticine or play dough in yellow, pink and orange
			* Pipe cleaners
			* Post it notes

Background – what are Tardigrades?

 Tardigrades, often called **water bears** or **moss piglets**, are near-microscopic animals with long, plump bodies and scrunched-up heads.

In this exercise, tardigrades have 16 chromosomes (in 8 homologous pairs) in their body cells. It is important that you understand what happens to form the **gametes** or sex cells.

Have a look at the parents – Mum and Dad Tardigrade. Note their characteristics, such as number of body segments, antennae etc. Both parents have the same features, but one is male and one is female!

Follow the instructions below to find out what happens when these organisms breed.

### Investigation

1. Cut out the chromosomes from the resource sheet and place into corresponding envelopes, one for Mum tardigrade’s chromosomes and one for Dad tardigrade’s chromosomes. (Teacher can do this prior to activity or Student can do this at the beginning of the activity).
2. Open each envelope, take out the cards and turn them face down, keeping Mum’s (pink) and Dad’s (blue) separate as you sort them out.
3. Sort each set of chromosomes into pairs of the same length (homologous pairs).
4. Now randomly take one chromosome from each pair of Mum’s chromosomes and place in a pile called ‘female gamete’.
5. Randomly take one chromosome from each pair of Dad’s chromosomes and place in a pile called ‘male gamete’.

Making the gametes like this is a model of meiosis – which halves the number of chromosomes in the gamete, so that when gametes combine at fertilisation, the new individual has the correct number.

1. Fertilise the female gamete with the male gamete by mixing together the female and male gamete piles. This is now your selection of ‘baby genes’ (or your zygote chromosome set).
2. Put the chromosomes you haven’t used back into their original envelopes.

You have now mixed a selection of half the chromosomes from one parent with a selection of half the chromosomes from the other parent to make a new combination. Each parent donated half the chromosome number (8 chromosomes) to make the adult number (16 – now in 8 homologous pairs again).

1. Sort out the chromosomes of your new individual into homologous pairs.
2. Write down the letters you have obtained in the ‘genotype and phenotype table’ for your ‘baby tardigrade’. For example, if you have one card with the letter **A** and another card with the letter **a**, your genotype is **Aa**.
3. Use the ‘decoder key’ to decide what the characteristics (phenotype) of your baby Tardigrade will be based on your genotype description. For example, if is genotype is **BB**, it will have 3 body segments.
4. Collect all the materials you need for your baby tardigrade body parts. For example, for 3 body segments you need 3 large marshmallows.
5. Build your baby tardigrade with the characteristics that its genes determine. Join the marshmallows with cocktail sticks.
6. Put your baby in the tardigrade nursery with the other newborns.

**QUESTIONS**

1. What do you notice about the features of the babies?
2. Are there any babies that are identical?
3. How many are the same as one of their parents? Which parent?
4. How much genetic material does each parent provide?
5. Where is this genetic material in the parent?
6. Write a couple of sentences explaining how sexual reproduction introduces genetic variation into offspring.
7. How do you think that features of your tardigrades might help them to survive in extreme environments?