



## Asexual versus Sexual Reproduction

Suggested time: 2 Hours

**What's important in this lesson:**

To understand that organisms may reproduce asexually, sexually or both. Other points that will be considered are various strategies used by organisms when reproducing and the potential benefits to organisms when using one or the other type of reproduction.

**Complete these steps:**

1. Complete the Student Handout: Asexual versus Sexual Reproduction and work through it at your own pace. You'll need a copy of a textbook for help in places. Check your answers with your teacher where needed.
2. Do the Student Handout: Flower Anatomy Lab.
3. Do the Assessment and Evaluation activity. Make sure you have about 10-15 minutes to complete the test and give this to your teacher.
4. Complete the Reflection activity.

**Hand-in the following to your teacher:**

1. Student Handout, including Flower Anatomy Lab
2. Assessment and Evaluation quiz
3. Reflection activity - Concept Map

**Questions for the teacher:**



## Asexual versus Sexual Reproduction

Asexual Reproduction occurs when there is only one parent that gives rise to an offspring which has the identical genetic makeup of the parent. It occurs in most single-celled organisms such as bacteria and some multicellular organisms such as fungi and some plants.

Sexual reproduction involves the combining of genetic information from two parents to produce a new organism that is a combination of both parents. It occurs in most complex organisms.

1) Complete the following table comparing asexual and sexual reproduction.

	Asexual Reproduction	Sexual Reproduction
number of parents		
genetic info compared to the parents		
Complexity of organism that uses this method		
example of an organism that uses this method		

2) Use the text: Science 9 Concepts and Connections pg. 85, Science 9 pg. 159, or Science Power pg. 29 to complete the summary table below by describing the asexual method of reproduction and providing an example of an organism that utilizes each method. You may want to draw a diagram along with your description.

<b>Name</b>	<b>Description</b>	<b>Example</b>
<b>Binary Fission</b>		
<b>Budding</b>		



<p><b>Fragmentation</b></p>		
<p><b>Spore Formation</b></p>		
<p><b>Vegetative Reproduction</b></p>		

**Asexual Reproduction in Plants**

The ability of plants to asexually reproduce comes from a group of unspecialized cells in the stem and roots called meristem. Meristem cells will at certain points become specialized and turn into root, leaf, and stem cells. The meristem are also the cells that are used when the plant has been injured and is in need of repair. Plants have several methods of asexually reproducing. Each type is based on the different part of the plant used (stems, roots, tissue).

**Stems:** Runners are part of a specialized stem that can produce a new individual. This stem “runs” along the ground and once it touches soil a distance from the parent, the stem will sprout roots and become a new individual. These runners can be removed and will still grow a new individual.

**Roots:** Some plants can regenerate a new individual from a small piece of root. These species of plants are difficult to kill because you must dig up all of the root in order to kill the plant. An example of this is a Dandelion, if you dig up part of it, it will regenerate from what is left.

**Leaves:** By using a leaf cutting some plants can be totally regrown. This is an artificial method of Asexual Reproduction that may be utilized in the horticulture business.



**Tissue:** This is a quick and economical way to grow plants. This is commonly used in the florist industry to produce large amounts of chrysanthemums, orchids, pine trees and roses. They remove specialized cells from the parent plant and put it in a nutrient rich solution. The cells quickly grow into a mature plant.

**Asexual Reproduction In Animals**

Invertebrates (animals without a backbone) make up most of the animal kingdom and most can reproduce asexually. Some invertebrates just simply divide in two and regrow/regenerate the missing parts (ex. Flatworms and sea stars). Most other asexually reproducing invertebrates do so by budding (same process as fungi). This occurs in sponges and hydras.



Fig. 1: A Hydra undergoing Budding

3) Identify the type of Asexual Reproduction in each of the following situations

- a) A clump of algae cells are struck by a wave and broken up into smaller clumps. Each of these smaller clumps grows into a new cell. \_\_\_\_\_
- b) A new strawberry plant begins to grow from the stem of a nearby plant \_\_\_\_\_
- c) A small yeast cell starts to grow on the outside of a larger cell. Eventually the smaller cell breaks away and continues to grow. \_\_\_\_\_
- d) A leaf is cut off a plant and is taken to another garden. The leaf is planted and grows into a new plant. \_\_\_\_\_

**Sexual Reproduction**

During Sexual Reproduction two specialized cells called sex cells or gametes (egg and sperm) are involved. Each gamete has only half the amount of DNA in a normal cell and are produced by a specialized type of division called meiosis. The reason why the gametes only contain half the DNA is so that when the new cell or zygote forms it will contain the correct amount of DNA. Zygotes are not identical to the parents. This means that Sexual Reproduction produces variation in offspring. This variation is important in a changing environment where an organism may have to be slightly different to survive.



**Sexual Reproduction in Plants**

There are a number of different plant groups. The Angiosperms are the flowering plants (such as roses, dandelion, maple trees etc). In these plants the flower contains the reproductive organs. Some flowers are hermaphrodites since they contain both the male and female reproductive organs while other flowers may only contain one of the sexes.

4. Use Science 9 Concepts and Connections pg. 94, Science 9 pg. 210 or Science Power pg. 62 to label the following diagram and tell the function of each of the parts.

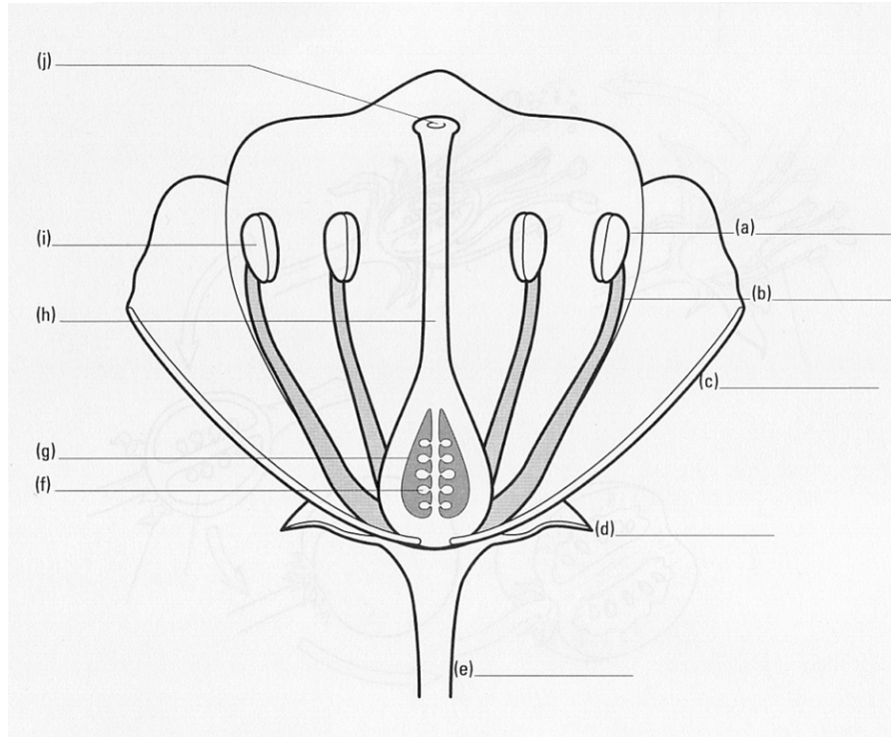


Fig. 2: Diagram of an Angiosperm flower

For Sexual Reproduction to be completed pollination must occur. During this process the pollen (sperm) must be transferred from the stamen to the stigma at the top of the pistil (often plants use insects or wind to accomplish the transfer). The pollen then releases the sperm and it travels down the style and fertilizes the eggs in the ovaries of the pistil. A zygote is formed that will undergo mitosis to form an embryo. The embryo will become part of a seed which also contains a food supply and a seed coat to prevent dehydration and has the potential to develop into a new plant.

5) How do insects and birds help with the process of pollination?



### Animal Sexual Reproduction

As in plants, animals must have a single sperm join its nuclear material with the nuclear material of an egg to form a zygote. Different species have different methods to achieve this result. Their fertilization patterns dictate how this is achieved. Sperm and egg must remain moist so that the egg is penetrable and the sperm can swim to it. An external fertilization pattern occurs when the gametes (sex cells) meet outside the bodies of both parents. To keep the sperm and egg moist it must occur in an aquatic environment. Internal fertilization occurs inside the female body in terrestrial or land animals. The sperm is transferred using a specialized structure from the male into the female body. The sperm must swim to the egg inside the female body where fertilization will take place. Some land animals such as birds and reptiles will then form a hard outer covering or shell around the zygote after which development will continue outside of the female body. Animals such as kangaroos and koala bears have specialized pouches where the young embryo will continue to develop and still others such as cows, dogs and humans have the young embryo complete development inside the female womb.

- 6) What is the main advantage of Sexual Reproduction?
  
- 7) What is a zygote? How is it different from daughter cells produced by Asexual Reproduction?
  
- 8) A karyotype is a picture of a cell's chromosomes. Use the diagrams below to describe how the chromosomes in a female zygote are different from those in a male zygote?

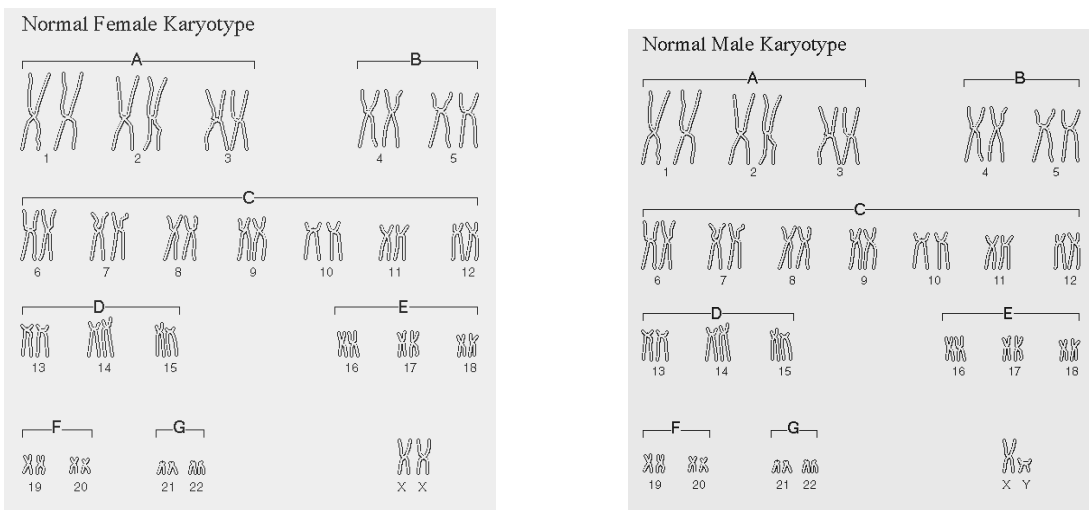


Fig. 3: Normal Human Female and Male Karyotypes

## Student Handout: Unit 2 Lesson 2



9) Classify the following as either Sexual or Asexual Reproduction. Explain your choice.

a) A small piece of a cactus breaks off the plant, falls to the ground, and begins to grow.

b) Pollen from a male poplar tree fertilizes sex cells on a female poplar tree.

c) Two earthworms each produce sperm and eggs and fertilize each other.

d) A flatworm is cut in half and grows into two flatworms.

### Flower Anatomy Lab

## Student Handout: Unit 2 Lesson 2



**Introduction:** It has been said that flowers are the ornaments of life. As you are well aware not all flowers look the same; they have different colours, shapes, odours etc. One can however notice many structural or anatomical similarities among flowers. In this lab you will examine some different types of flowers and determine what similarities and differences there are.

**Materials:** Various flowers (at least 2), magnifying glass, pair of tweezers and a knife.

**Procedure:**

- 1) Obtain a flower and begin to examine it with a magnifying glass.
- 2) Record in the table below the number of petals, sepals, and stamens on your flower.
- 3) Record the same data using a different flower.
- 4) Remove a few petals and sepals from your flower and carefully examine the inside parts of the flower.
- 5) Record the number of pistils present in your two different flowers.
- 6) Draw a diagram of your flower (colour would be appropriate), labeling the petal, sepal, and all male and female reproductive parts.
- 7) Carefully cut vertically through the pistil of the flower. This provides you with two halves.
- 8) Draw and label the internal structures of the pistil.
- 9) Repeat for the second flower.

**Observations:** While following the procedure answer the questions in the chart below.

<b>Characteristic</b>	<b>Flower 1</b>	<b>Flower 2</b>
number of petals		
number of sepals		
number of stamens		
number of pistils		
labelled diagram of flower		
labelled diagram of pistil		





**Modified True/False**

*Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.*

- \_\_\_ 1) Sperm cells have half as many chromosomes as an unfertilized egg
- \_\_\_ 2) Binary Fission is a type of Sexual Reproduction that occurs in bacteria.
- \_\_\_ 3) Birds and reptiles reproduce by internal fertilization.
- \_\_\_ 4) Most mammals such as humans reproduce asexually.

**Multiple Choice**

*Identify the letter of the choice that best completes the statement or answers the question.*

- \_\_\_ 5) As a result of Asexual Reproduction, the daughter cells are
  - a. identical to each other and the mother cell.
  - b. different from the mother cell.
  - c. different from each other and the mother cell.
  - d. none of the above.
  
- \_\_\_ 6) Which of the following describes the main advantages of Sexual Reproduction?
  - a. Two parents share the duties of caring for offspring.
  - b. Contributions from the parents allow for genetic variation.
  - c. Each offspring is able to survive better than the parent.
  - d. The parents are better able to survive than the offspring.
  
- \_\_\_ 7) Which of the following shows the correct chromosome combination for a female human?
  - a. XX plus 44 other chromosomes.
  - b. XY plus 44 other chromosomes.
  - c. XX plus 23 other chromosomes.
  - d. XY plus 23 other chromosomes.
  
- \_\_\_ 8) A general name for a sex cell (egg or sperm) is a:
  - a. zygote
  - b. embryo
  - c. Egg
  - d. Gamete

## Assessment and Evaluation: Unit 2 Lesson 2

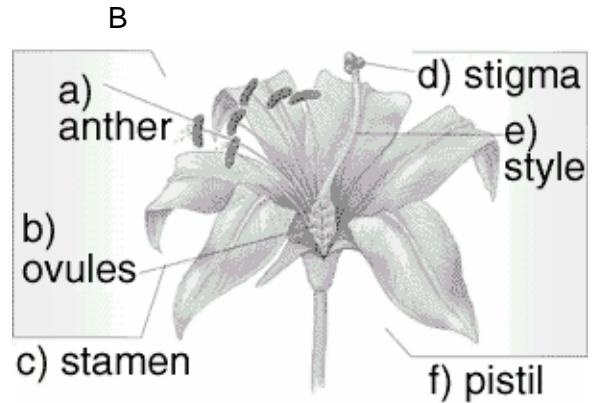


- \_\_\_\_ 9) When a starfish loses an appendage, the appendage is able to make another starfish by the process of:
- a. cloning
  - b. fragmentation
  - c. spore formation
  - d. conjugation

### Short Answers

- 10) Reproductive parts of a flower.

- A
- \_\_\_\_ i. pollen produced here
  - \_\_\_\_ ii. male reproductive organ
  - \_\_\_\_ iii. sacs containing female gametes
  - \_\_\_\_ iv. sticky "lip" that captures pollen grains
  - \_\_\_\_ v. female reproductive organ



- 11) Use two examples to explain the difference between internal and external fertilization.



## Asexual versus Sexual Reproduction

a) Complete the following concept map using the following terms:

Separate sexes, fragmentation, budding, hermaphrodites, binary fission, spore formation, and vegetative reproduction.

