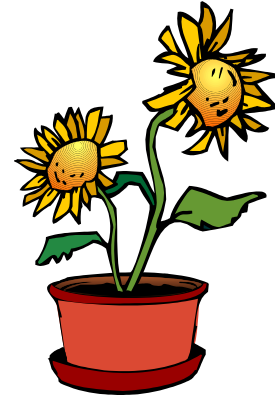


Name \_\_\_\_\_ Name \_\_\_\_\_

Date \_\_\_\_\_  
2011



### World's Best Artificial flower

#### Part A: A short history of pollen

The evolutionary success of plants can be easily appreciated by everyone. As autotrophs, plants form the basis of food chains without which we and other animals could not exist. Plant adaptations to insure pollination are crucial. For a plant to reproduce, the pollen (male gamete) must travel from the male sex organs of the flower to the female sex organs located in flowers of the same species. Usually the male and female sex organs occur in the same flower. However, sometimes a plant species produces separate male and female flowers on the same plant. In less common instances, some species produce male flowers on one plant and female flowers on another.

Cross pollination and fertilization offer adaptive advantages to plant species. The evolution of an array of pollination strategies is reflected in the structure and development of pollen grains. There are three main categories of pollination: wind, water, and animals. Wind and animals are the most common.

Wind pollination originated with the gymnosperms (conifers) such as pines and spruces. Conifers produce pollen that is uniquely structured to drift on the wind. Their pollen has one or more bladders (little sacs) that increase the surface-to-volume ratio thus making them more buoyant. To be successful, drifting pollen must adhere to sticky plant sap formed by a female sex organ of the same species. The typical size of pollen produced by conifers ranges from 40-130 micrometers.

During prehistoric times, some pollen would have landed on the ground—just as it does today. Insects, such as beetles, crawling around on the ground searching for food could have come into contact with the pollen. As they continued their search for food in and around the female sex organs of the conifers, the beetles could have pollinated the plants. For these conifers, insect pollination would be much more successful than wind pollination. Random changes in the insects and conifers over time made the process even more likely. Hence, plants and insects have coevolved.

Angiosperms, flowering plants, evolved later than gymnosperms. The more attractive their flowers were to insects, the more frequently the insects would visit, thus circulating greater amounts of that flower's pollen. This would lead to more seeds being produced which carried the genetic code of the flower insects found more attractive. In their coevolution, angiosperms benefited with increased dispersal of the male gamete (pollen) and the insects were provided with carbohydrates, amino acids, and lipids from the nectar and pollen. Any chance mutations that made one flower more attractive to foraging insects than other flowers would provide that flower with a selective advantage. Pollen

grains range in size from 12-40 micrometers in angiosperms that are pollinated by insects.

Read through Table 1: *Pollinator-Flower Characteristics Chart*. Then answer questions 1 - 5 which start below.

**Questions** (Answer the following questions on your own paper.):

1. Why is gymnosperm pollen typically larger than angiosperm pollen?
2. Why would flowers of plant species which rely on wind pollination not be likely to produce large amounts of nectar or have showy, bright petals?
3. What color adaptations do plants pollinated by nocturnal organisms show?
4. Would the pollen grains of plants pollinated by insects be most successfully carried if they were textured with little spines or smooth? Explain your answer.
5. Of what advantage would it be to a plant to produce pollen that is sticky and often sticks to other pollen grains? Would even more “stickiness” be better? Explain.

**Part B: Create a flower:**

This will be a group project. Each team’s task is to invent a flower that can survive in a specified habitat, design pollen of the appropriate size and surface texture to be produced by the flower, and create a pollinator organism(wind and water are not possibilities!) which can successfully transport the pollen from the male to the female reproductive structure of your plant species.

The team should be divided so that one person is the pollen expert, another the flower specialist, and the third person is the pollinator authority. The information on the cards provides a few of the flower’s characteristics and habitat. You cannot change the characteristics or habitat. However, you are free to go beyond what the cards indicate in the design and construction of your flower, pollinator, and pollen models. All three must function together so that the flower is reproductively successful and the pollinator is able to obtain what it requires from the flower. Your flower might be monoecious or dioecious based on the characteristics on the cards you selected. Be creative. The flower expert will construct a three-dimensional model and label key parts of the flower the team designs. The pollen person will write a description of the pollen and include a number of illustrations with their work. The pollinator authority will construct a three- dimensional model of the pollinator and write a short description of how it transports the pollen.

**You must also show how the leaves, stems and roots would look in cross section. Describe the seeds. This information must be consistent with monocot/dicot. Discuss any other adaptations you plant would have related to the biome in which it grows. Include if it would be a C3, C4 or CAM plant.**

Once you have selected roles, record the name of the team member by the task each has chosen.

Pollen Expert \_\_\_\_\_ Flower Specialist \_\_\_\_\_

Pollinator Authority \_\_\_\_\_

As a group, decide on what information you will need and how you can best obtain and share that information.

**Materials I will provide: (per group)**

- 6 pcs tissue paper
- construction paper
- glue stick
- 6 pipe cleaners
- scissors

You will need to provide any other materials

**Your completed models and research will be due on \_\_\_\_\_.**

**You will need to present your flower to the class.**

**Your presentation will be graded as follows:**

\_\_\_\_\_ The flower is shown/described as a monocot/ dicot based on leaf, stem, roots, flowers and seeds( 15 pts)

\_\_\_\_\_ The pollinator is appropriate for the flower structure and color. (10 pts)

\_\_\_\_\_ The **coevolution** between the flower's pollen and the pollinator is described.(10 pts)

\_\_\_\_\_ all members of the group participate in the presentation. (5 pts)

\_\_\_\_\_ Presentation was organized and well prepared. Group was able to answer questions. (10 pts pts)