

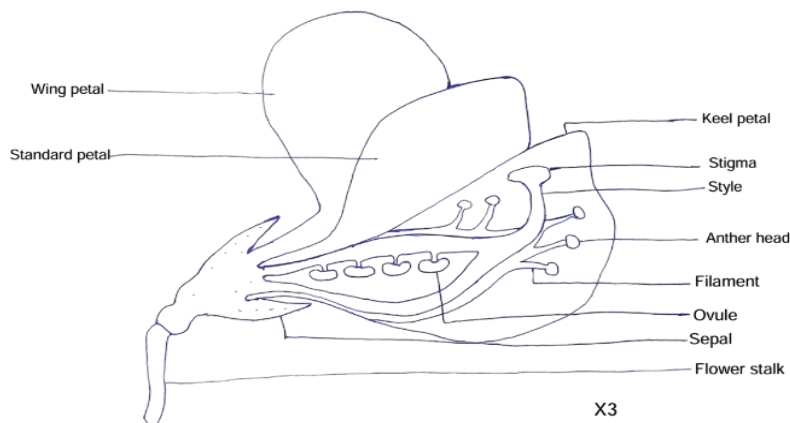
## BIOLOGY SELF CHECK TOOL (GUIDE)

Class: **Senior four**

Topic: **Sexual reproduction in plants** (1 of 1)

**Scenario:** Ms. Nandutu, a farmer in Sironko, cultivates common beans. She understands planting seeds yields new plants and harvests pods, but she's curious about the flowers. Many bloom, yet not all develop into pods. She seeks to understand the biological processes within the flower that lead to the formation of edible beans, and how those seeds initiate new plants each season. You are tasked with clarifying these biological wonders.

DRAWING OF LONGITUDINAL SECTION OF A BEAN FLOWER



**(a)** Identify four key flower structures and outline their specific functions in the reproductive process of a typical bean flower.

### Responses

Sepals; ✓ the outermost, often green, leaf-like structures that enclose and protect the flower bud before it opens; ✓

Petals; ✓ typically, brightly coloured and scented to attract pollinators ✓

Stamen; ✓ the male reproductive part; ✓ consisting of an anther (which produces pollen, containing male gametes) and a filament (which supports the anther); ✓

Pistil; ✓ (or Carpel), the female reproductive part; ✓ comprising the stigma (a receptive surface for pollen), the style (a stalk connecting the stigma to the ovary), and the ovary (which contains ovules, housing the female gametes); ✓

**(b)** Explain the biological processes of pollination, fertilization, and subsequent fruit (pod) formation in order of their occurrence.

### Responses

The process begins with **pollination**; ✓ the transfer of pollen grains from the anther to the stigma; ✓ In beans, this often occurs in form of **self-pollination**; ✓ using the pollen from the same flower or plant; ✓ Once on the stigma, the pollen grain germinates, forming a pollen tube; ✓ that grows down through the style to the ovary; ✓

Inside the ovary, **fertilization** occurs; ✓ where a male gamete from the pollen tube fuses with the female gamete; ✓ (egg cell) within an ovule. After successful fertilization, the ovules develop into **seeds**; ✓ (the beans), and the ovary wall matures and swells to form the fruit; ✓ (the bean pod) that encloses these seeds; ✓

**(c)** Differentiate between cross-fertilisation and self-fertilisation. Discuss which method is predominant in common beans and provide a biological reason why some flowers might fail to form pods, despite abundant blooming.

### Responses

Self-fertilisation	Cross-fertilisation
Involves pollen from the same flower or another flower on the same plant; ✓	Pollen from a flower on a different plant; ✓

Offspring are genetically identical to the parent; ✓	Offspring may vary since genes from two parents are involved; ✓
Often doesn't strictly require external agents of pollination; ✓	Typically requires external agents to transfer pollen; ✓ like the bees
Lower adaptability to changing environments due to less genetic diversity; ✓	Higher adaptability to changing environments due to increased genetic diversity; ✓

### **Why beans sometimes fail to produce pods**

Common beans mostly carry out self-pollinating; ✓ Despite abundant blooms, flowers may fail to form pods due to environmental stress; ✓ (e.g., heat, drought), nutrient deficiencies, or pest/disease pressure; ✓ Even with self-pollination, suitable conditions are crucial for pod development; ✓

**(d)** Differentiate structurally and functionally between a 'seed' and a 'fruit', using the bean (seed) and its pod (fruit) as your specific example.

#### Responses

The fruit is the mature ovary of a flowering plant; typically enclosing the seeds; ✓ In a bean plant, the entire bean pod is the fruit. Its primary biological functions are to protect the developing seeds and aid in their dispersal; ✓

A seed is a mature ovule, containing an embryo and stored food reserves; ✓ all enclosed within a protective seed coat. In a bean plant, the individual beans inside the pod are the seeds; ✓

Its primary biological function is to propagate the plant; ✓ containing all the genetic information and resources for a new plant to grow.

Structurally, the fruit (pod) is the larger, ✓ outer casing, while the seeds (beans) are smaller; ✓ individual units contained within the pods.

***The learner can as well use a table to present their work***

**(e)** Explain the biological importance of seed dispersal for plant survival. Then, describe the structures of a mature bean pod and its seeds, and relate these structures to their most likely natural methods of dispersal.

#### Responses

Seed dispersal is important for plant survival and colonization because it reduces competition; ✓ for light, water, and nutrients between parent plants and their offspring; ✓

It also allows plants to colonize new habitats; ✓ increasing their geographical range and reducing the risk of a single localized threat; ✓ (like disease or pests) wiping out an entire population.

The typical structure of a mature bean pod is a dry, dehiscent fruit; ✓ classified as a legume; ✓ When mature and dry, the pod naturally splits open; ✓ along two sutures; ✓ often ejecting the seeds with some force' ✓ (a form of explosive dehiscence) or allowing them to simply fall due to gravity close to the parent plant.

**Competency:** The learner understands that the flower is the specialized organ in which all events of a plant's sexual reproduction occur, leading to the formation of an embryo located in the seed.