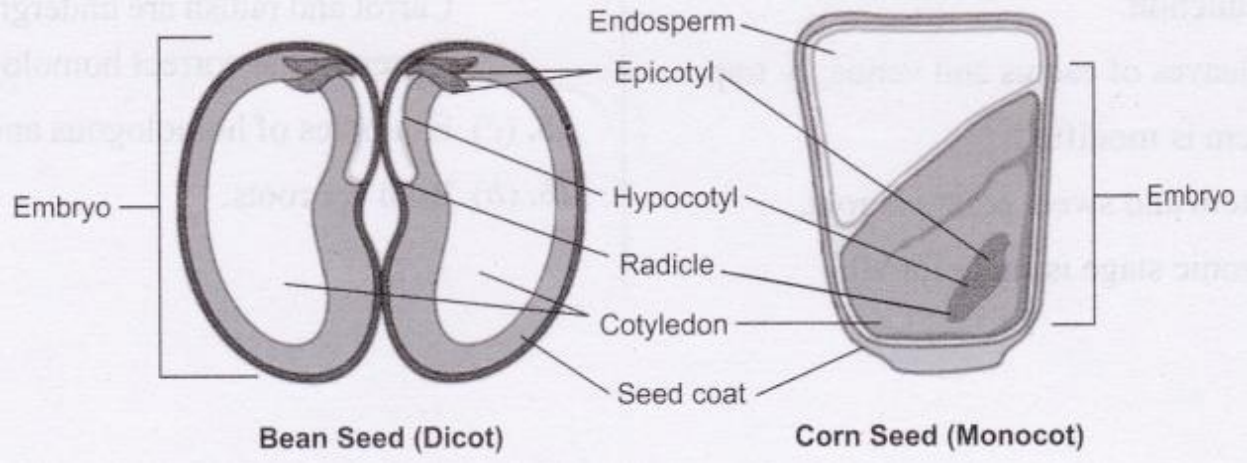
Dicot Seed

- **Seed:** A seed is formed by the fertilized ovule and pollen egg. It contains, reserve food and protective coat. When the seed is sown in soil/ kept in soaked wet cotton a new plant appears from the embryo.

- The seed consists of an outer coat called testa. Enclosed in it is the stored food and an embryo plant. The food may be stored in the cotyledon or around the embryo on the endosperm.
- **Monocot seed:** The seed having only one cotyledon is called monocot seed. For e.g., maize and wheat seed.
- **Dicot seed:** The seed having two cotyledons is called dicot seed. For e.g., gram and bean seed.
- On the basis of the presence or absence of endosperm, both in dicot and monocot seed, they are classified as endospermic or non-endospermic seeds.
- **Endospermic seed:**
  (a) Seeds are with endosperm.
  (b) Food is stored in the endosperm.
  (c) Seed's may be of monocot or dicot.
  E.g. Castor, maize
  (d) Cotlyledons are thin like paper.
- **Non-endospermic seed:**
  (a) Seeds are without endosperm.
  (b) Food is stored in the cotyledon.
  (c) Seeds are of dicot type.
  E.g. Pea, bean
  (d) Cotyledons are thick and fleshy.
- **Structure of dicot seed (bean seed):** The seed coats have characteristic colours. When the seeds are soaked in water, they swell considerably and the seed coats become soft. In this condition the seed coats are easily removed. The cotyledons or seed leaves, can be easily seen.
- Structure of monocot seed (Maize seed): Each grain is made up of following^parts:
  1. Seed coat: It is the outer brownish layer of the grain. In this, seed and fruit wall are fused together.
  2. Endosperm: It comprises the major part of grain and is filled with reserve food. It is composed of two regions:
  (a) Outer single layer is made up of proteins.
  (b) Inner starchy endosperm. It is separated from embryo by a layer called epithelium.
  3. Embryo: It contains a single lateral cotyledon and embryo axis with plumule and radicle are at its two ends.



Biology Lab Manual Experiment 6

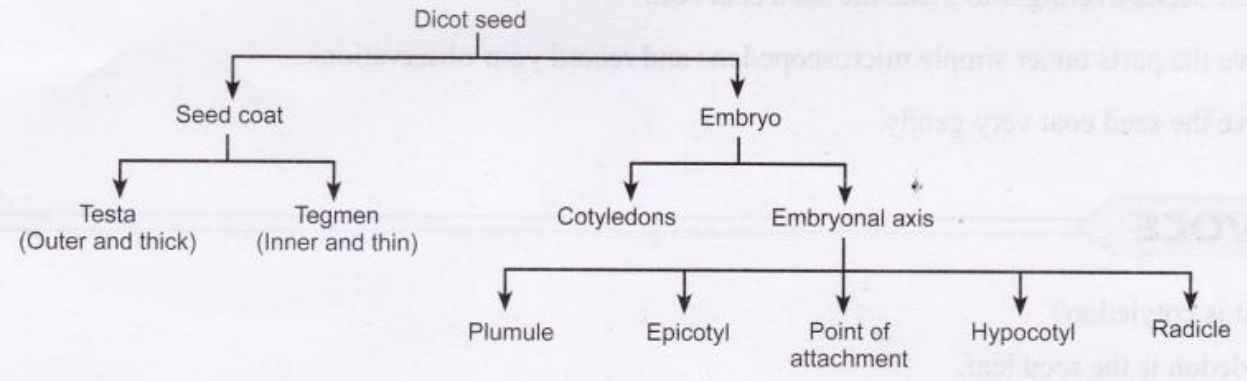
Aim

To identify the different parts of an embryo of a dicot seed (pea, gram or red kidney bean).

Theory

- **Seed:** Seed is a small embryonic plant present in a safe coating of seed coat, it stores food.
- **Seed formation:** The male gamete of plant, i.e., pollen grains and female gamete of a plant, i.e., ovules fuse together to form seed. The seed formation takes place due to fertilization, and it is the product of reproduction in plants. The embryo of seed is formed from the zygote.
- **Food in seed:** The food is stored in the cotyledons of embryo in some plants and in the endosperm, a special tissue outside the embryo in other plants.
- Three basic parts of a seed:
  1. An embryo
  2. Nutrient for embryo
  3. Seed coat.
- **Embryo:** The embryo of seed is an immature plant from which a new plant can grow.
- The radicle that comes out of the embryo is the embryonic root. The plumule is the embryonic shoot.
- **Cotyledons:** It is the seed leaf present in seed. If the embryo has one seed leaf it is monocotyledon and if it has two seed leaves it is dicotyledon.
- **Epicotyl:** The part of the embryonic stem above the point of attachment of the cotyledon is the epicotyl.
- **Hypocotyl:** The area between the radicle and the place of origin of cotyledons is termed as hypocotyl.

- Nutrients for the Embryo: Seed stores nutrients for the growth of an embryo during germination. The nutrients/ stored food is in the form of oil, fat and protein.
- **Seed Coat:** The seed coat protects the embryo from mechanical injury and from drying out. It can be a paper thin as in case of peanut or may be very thick e.g. coconut.



Materials Required

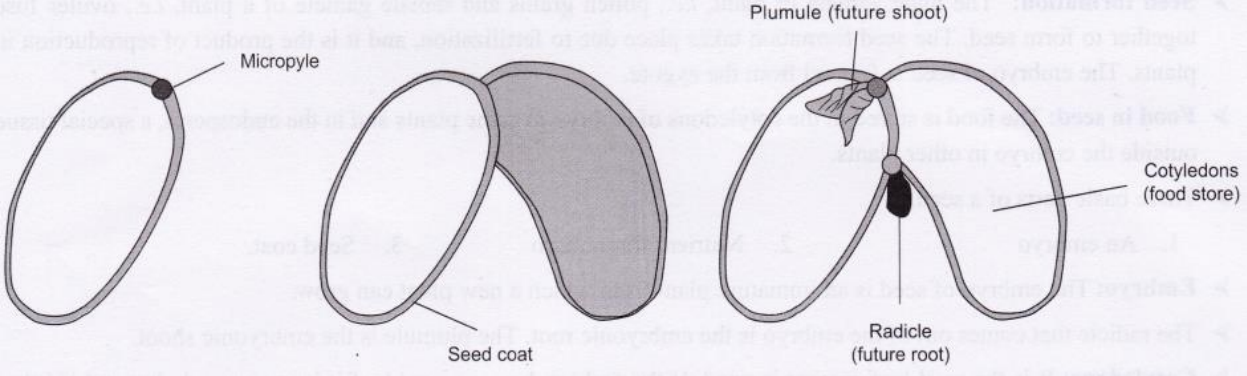
Water soaked seeds of pea, gram or red kidney beans, petridish, forcep, needle, brush and simple microscope and slide.

Procedure

1. Take 8-10 soaked seeds of pea/gram/red kidney beans, place them on wet cotton in petridish overnight. The seed coat becomes soft which helps in the opening of the seeds.
2. With the help of forcep, slowly remove the seed coat and study different parts of seed embryo.
3. Now, slowly remove the embryo axis with needle and place it on the slide.
4. Observe these three parts of the seed obtained, record your observations and draw diagrams.

Observations

1. The seed has a small pore called micropyle.
2. It is a dicot seed, i.e., the seed has two cotyledons.
3. The embryo axis shows radicle and plumule, (as shown in the figure), the radicle is future root and the plumule is future shoot.
4. The food is stored in cotyledons.



Conclusion

The different parts of an embryo of a dicot seed were identified as plumule (future shoot), radicle (future root), seed coat (outer covering) and cotyledons (food store)

Precautions

1. The best quality seeds should be used for study.
2. Soak the seeds overnight to make the seed coat soft.
3. Observe the parts under simple microscope/lens and record your observations.
4. Remove the seed coat very gently.

Biology Lab Manual Viva Voce

Question 1:

What is cotyledon?

Answer:

Cotyledon is the seed leaf.

Question 2:

What is epicotyl?

Answer:

The part of the embryonic stem above the point of attachment of the cotyledon is called epicotyl.

Question 3:

What is hypocotyl?

Answer:

The area between the radicle and the place of origin of cotyledon is termed as hypocotyl.

Question 4:

Name two dicot seeds.

Answer:

Pea, gram.

Question 5:
Differentiate between monocot and dicot seeds.
Answer:
Monocot seeds are made up of one cotyledon. Dicot seeds have two cotyledons.

Biology Practical Based Questions

Question 1:
Name two types of seed.
Answer:
Moncot and dicot.

Question 2:
Name two monocot seeds.
Answer:
Maize and wheat.

Question 3:
Name three parts of seed.
Answer:
The seed has seed coat, micropyle and cotyledon.

Question 4:
What is the function of endosperm in the seed?
Answer:
Endosperm stores food/nutrients in the seed.

Question 5:
Name three different forms of food storage in endosperm/seed.
Answer:
Food in seed is stored in the form of oil, fat and proteins.

Question 6:
What is present on embryo axis?
Answer:
The embryo axis has plumule and radicle.

Question 7:
What do plumule and radicle grow into?
Answer:
Plumule grows into shoot and radicle grows into root.

Question 8:
When we open a dicotyledon seed, then its embryo shows two parts. Name these two parts and write their functions. **[Outside Delhi 2011]**
Answer:
Two parts of the embryo are: Plumule and Radicle.
Plumule after germination develops into shoot of the new baby plant.
Radicle after germination develops into the root of the new baby plant.

Question 9:
What are cotyledons? How are the number of cotyledons different in gram seed and the maize (com) seed?
[Outside Delhi 2012]
Answer:
Cotyledons are special structures in the seeds of the plants. Cotyledons store food for the embryo of the plant.
In gram seeds, there are two cotyledons and in maize (corn) seeds, there is only one cotyledon.

Biology Lab Manual Multiple Choice Questions (MCQs)

Questions based on Procedural and Manipulative Skills
Question 1:
Food is stored in the seed in the form of
(a) oil
(b) protein
(c) fats
(d) all of these

Question 2:
The condition needed by dormancy is
(a) exposure to heat
(b) Exposure to moisture
(c) exposure to cold
(d) Sowing in soil

Question 3:
The leaves of the seed is called
(a) epicotyl
(b) hypocotyl
(c) micropyle
(d) cotyledon

Question 4:
The small pore, through which water enters in few

(a) cotyledon
(b) plumule
(c) radicle
(d) micropyle

Question 5:
The future root present on embryonic axis in the seed is called
(a) radicle
(b) plumule
(c) epicotyl
(d) cotyledon

Question 6:
The future shoot present on embryonic axis in the seed is called
(a) radicle
(b) plumule
(c) epicotyl
(d) cotyledon

Question 7:
The baby plant inside the seed is called
(a) cotyledon
(b) ovule
(c) pollen
(d) embryo

Question 8:
When the pollen unites with ovule to form seed it is called
(a) germination
(b) pollination
(c) fertilization
(d) reproduction

Question 9:
Which of the following flower parts develop into a fruit after pollination?
(a) Ovule
(b) Ovary
(c) Stamen
(d) Stigma

Question 10:
What is the name given to the food storage structure that surrounds the embryo in a dicot seed?
(a) Cotyledon

(b) Plumule
(c) Radicle
(d) Ovary

Questions based on Observational Skills

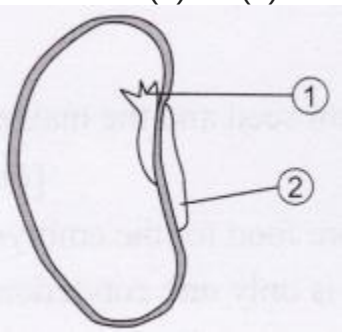
Question 11:

It is the thin layer of seed called

(a) seed coat
(b) embryo
(c) micropyle
(d) endosperm

Question 12:

The labels(1)and(2) in the alongside figure ovule



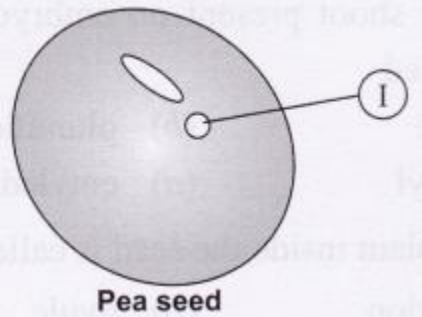
(a) (1) radicle (2) endosperm (3) cotyledon
(b) (1) plumule (2) endosperm (3) radicle
(c) (1) plumule (2) cotyledon (3) radicle
(d) (1) plumule (2) seed coat (3) radicle.

Questions based on Reporting and Interpretation Skills

Question 13:

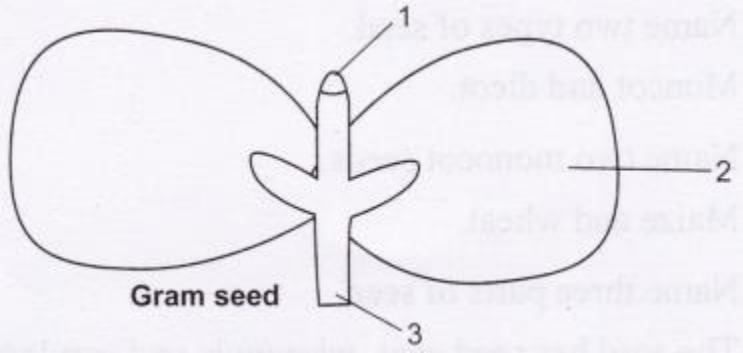
A seed develops from
(a) pollen grain
(b) ovule
(c) ovary
(d) fertilized ovule

Question 14:
The label (I) in pea seed is



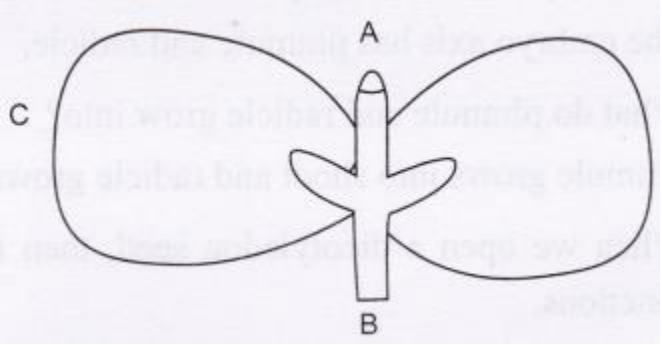
(a) cotyledon
(b) micropyle
(c) seed coat
(d) plumule

Question 15:
The correct labels (1), (2) and (3) made by a student while studying different parts of gram seed are



(a) (1) radicle (2) endosperm (3) cotyledon
(b) (1) plumule (2) endosperm (3) radicle
(c) (1) plumule (2) cotyledon (3) radicle
(d) (1) plumule (2) seed coat (3) radicle.

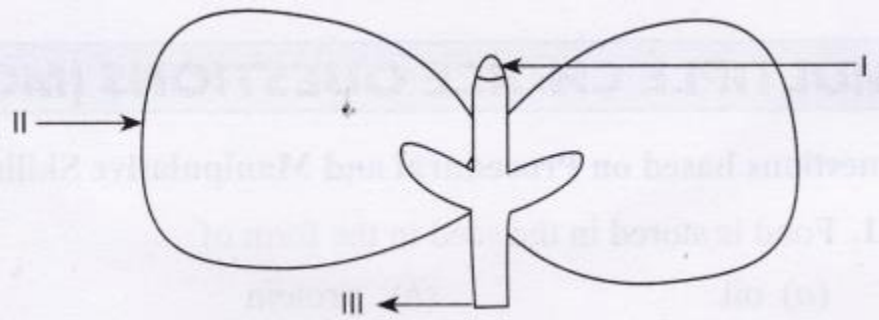
Question 16:
In the figure, the parts marked A, B and C are sequentially: [Delhi 2013]



(a) Plumule, Radicle and Cotyledon

(b) Radicle, Plumule and Cotyledon
(c) Plumule, Cotyledon and Radicle
(d) Radicle, Cotyledon and Plumule

Question 17:
In the following diagram showing the structure of embryo of a dicot seed, what are the parts marked I, II and III sequentially? [Outside Delhi 2014]



(a) Plumule, Cotyledon, Radicle
(b) Plumule, Radicle, Cotyledon
(c) Cotyledon, Plumule, Radicle
(d) Radicle, Plumule, Cotyledon

Answers:

1. (d)	2. (b)	3. (d)	4. (d)	5. (a)
6. (b)	7. (d)	8. (c)	9. (b)	10. (a)
11. (a)	12. (c)	13. (d)	14. (b)	15. (c)
16. (a)	17. (a)			

Biology Lab Manual Scoring Key With Explanation

1. (d) Stored forms of food.
2. (b) Moisture helps in softening of seed coat and further initiates the outgrowth from seed.
3. (d) Cotyledons are called seed leaves.
4. (d) Micropyle is the pore in seeds.
5. (a) Radicle becomes root.
6. (b) Plumule becomes shoot.
7. (d) Embryo is the first stage of development.
8. (c) Fertilization is the fusion of male and female gametes.
9. (b) Ovary becomes fruit and fertilized ovule becomes a seed.
10. (a) It is present in seed as leaves structure.
11. (a) Seed coat protects the seed.
12. (c) Radicle is longer and grows towards gravity.
13. (d) Ovules are fertilized by pollens to form zygote and then changed into a seed.

14. (b) A tiny hole in the testa is called the micropyle.
15. (c) The leaves are cotyledon, root grows down towards gravity.
16. (a) Option (a) has correct labels.
17. (a) Correct parts are labelled in option (a).