**Semester-II**

**Core Course IV: Archegoniate Course Code: BOTACOR04T**

**Unit 6: Model questions Gymnosperms-II**

**Dr. Madhushri Das**

**Assistant Professor, Dept. Of Botany**

**HMMC for Women, Dakshineswar**

**Few important short questions and model answers**

1. **What is coralloid root? Give example.**

Cycad seedlings initially form a stout, fleshy taproot that persists in subterranean forms for many years but is augmented by secondary roots which also are quite thick and fleshy. The taproots, larger secondary roots, and, in some cases, underground stems, have contractile elements in the pith and cortex that draw the stem more deeply into the ground.

Branch roots are of two kinds: long-branching geotropic roots and **short-branching apogeotropic roots, which are referred to as coralloid because of their irregular, beady appearance. The****coralloid roots contain symbiotic cyanobacteria (blue-green algae), which fix nitrogen and, in association with root tissues, produce such beneficial amino acids as asparagine and citrulline.**

The taproot does not persist long in arborescent cycads but is replaced by large adventitious roots, which obscure the basic taproot system of the seedling. In all cycads, young roots are diarch with a parenchymatous cortex and an outer cover of epidermal scales. In this aspect they also resemble seed ferns. Older roots become triarch or tetrarch, eventually developing substantial amounts of wood and an outer covering of periderm. **Example: *Cycas***



**Coralloid roots:** These secondary roots are found on all Cycads. They form masses of lightly colored, club shaped structures, at or near the surface of the soil. Usually containing cyanobacteria, they are important in nitrogen fixation.

1. **What is girdling leaf-trace? Name the genus where it is found? (WBSU, 2011,2013)**

**Girdling Leaf Traces:** Also found in some ferns, these leaf traces arise from the stele at a point opposite the point of leaf attachment and encircle the stem. 

1. **What is form genus? (2014)** 2

In [paleobotany](https://en.wikipedia.org/wiki/Paleobotany), two terms were formerly used in the codes of nomenclature, "form genera" and "organ genera", to mean groups of fossils of a particular part of a plant, such as a leaf or seed, whose parent plant is not known because the fossils were preserved unattached to the parent plant. A later term "morphotaxa" also allows for differences in preservational state. These three terms have been replaced as of 2011 by provisions for "fossil-taxa" that are more similar to the provisions for other types of plants.

Names given to organ genera could only be applied to the organs in question, and could not be extended to the entire organism. Fossil-taxon names can cover several parts of an organism, or several preservational states, but do not compete for [priority](https://en.wikipedia.org/wiki/Principle_of_Priority) with any names for the same organism that are based on a non-fossil [type](https://en.wikipedia.org/wiki/Type_%28biology%29).

The part of the plant was often, but not universally, indicated by the use of a [suffix](https://en.wikipedia.org/wiki/Suffix) in the [generic name](https://en.wikipedia.org/wiki/Name_of_a_biological_genus):

* wood fossils may have generic names ending in *-xylon*
* leaf fossils generic names ending in *-phyllum*
* fruit fossils generic names ending in *-carpon*, *-carpum* or *-carpus*
* pollen fossils generic names ending in *-pollis* or *-pollenoides*.

Since the names of species, and consequently of many higher taxa, of fossil plants are usually based on fragmentary specimens, and since the connection between these specimens can only rarely be proved, organ-genera (organo-genera) and form-genera (forma-genera) are distinguished as taxa within which species may be recognized and given names according to Code.

 An organ-genus is a genus assignable to a family. A form-genus is a genus unassignable to a family, but it may be referd to a taxon of higher rank.

Form-genera are artificial in varying degree.

 Examples: **Organ-genera**: Lepidocarpon Scott (Lepidocarpaceae, Mazocarpon (Scott) Benson (Sigillariaceae), Siltaria Traverse (Fragaceae).

**Form-genera**: Dadoxylon Endl. (Coniferopsida), Pecopteris (Brongn.) Sternb. (Pteropsida), Stigmaria Brongn. (Lepidophytales and Lepidospermales), Spermatites Miner (Cormophyta, excl. Eocormophyta et Palaeocormophyta microphylla).

1. **Differentiate between cycads and cycadeoids. (WBSU, 2014) 2**

**Cycadeoids**

Although a few groups of pteridosperms persisted from the late Paleozoic Era well into the Mesozoic, the common cycadophytes of the latter ages were members of the [Cycadeoidophyta](https://www.britannica.com/plant/Cycadeoidophyta) (also known as Bennettitophyta). They are well represented in the later Mesozoic Era, well into the [Cretaceous Period](https://www.britannica.com/science/Cretaceous-Period) (about 145.5 to 65.5 million years ago), by members of the [genus](https://www.britannica.com/science/genus-taxon)  *[Cycadeoidea](https://www.britannica.com/plant/Cycadeoidea)* , which had rather squat, barrel-shaped, unbranched trunks and once-pinnate compound leaves. The stems were armoured with the persistent bases of leaves; internally there was thick pith surrounded by a narrow zone of vascular tissue from which vascular strands extended directly into the leaf bases. The fossilized trunks of these plants display scattered strobili among leaf bases of the characteristic armour. Fossil cycadeoids are widespread but are especially abundant in the Black Hills region of South Dakota. Earlier in the Mesozoic Era, cycadeoids of a more slender, branching form, exemplified by *Williamsonia*, were abundant. As in *Cycadeoidea*, the fronds were single pinnate compound leaves.

The feature that set the cycadeoids apart from other cycadophytes was the compound strobili, which some, but not all, possessed. These strobili were composed of both male and female sporophylls, in some cases subtended by a system of bracts. Although often described as flowerlike and indeed sometimes depicted as having a floral, rosette form, cycadeoid “flowers,” unlike true flowers (found in the angiosperms), were composed of sporophylls bearing “naked” (i.e., gymnospermous) ovules. They are not now considered to have given rise to any group of the true angiospermous flowering plants.

Although cycadeoids flourished for millions of years, and must therefore be considered as a highly successful line of plants, they eventually became extinct in the Cretaceous Period.

**Cycads**

The living cycads are for the most part palm-like, cone-bearing plants, generally of low stature. Although few genera, species, and individuals exist, they are extremely important plants in terms of the information that can be gained from studying them. Their reproduction is very primitive in that they rely on flagellated, motile male gametes (spermatozoids), a feature linking them with other plants fertilized by motile flagellated sperm (zooidogamous), such as ferns, club mosses, and other vascular cryptogams. Without knowledge of fertilization in the cycads and *Ginkgo*, it is highly unlikely that scientists would have more than remote theories as to the reproductive modes of seed ferns and other extinct groups of seed plants. Research on [cycad](https://www.britannica.com/plant/cycad) reproduction is also providing information on the early origins of [insect](https://www.britannica.com/animal/insect) pollination, long thought to have evolved along with the relatively more recent angiosperms, or flowering plants.

**Cycads have epidermal cells with straight margins, thin cuticle, and irregularly oriented stomata. Generally, cycads, conifers, seed ferns, *Ephedra, Ginkgo*, and the angiosperms all have haplochelic stomata, where the guard cells of the stoma develop from one epidermal initial and the associated subsidiary cells from another initial.**

**In contrast, cycadeoids, *Gnetum* and *Welwitschia* have syndetochelic stomata (where guard cells and adjacent subsidiaries come from the same initial). Cycadeoids are also characterized by epidermal cells patterns with wavy margins, thick cuticles and cells aligned in rows, and stomata occurring at right angles to the veins.**

1. **How can you differentiate between haplocheilic and syndetocheilic stomata? (WBSU, 2014) 2**

Generally, cycads, conifers, seed ferns, *Ephedra*, *Ginkgo*, and the angiosperms all have **haplochelic stomata**, where the guard cells of the stoma develop from one epidermal initial and the associated subsidiary cells from another initial. In contrast, cycadeoids, *Gnetum* and *Welwitschia* have **syndetochelic stomata** (where guard cells and adjacent subsidiaries come from the same initial).

**Answer the following questions:**

***Cycas***

**What is circinate vernation? Where it is found?**

**Mention two fern characters of *Cycas*.(WBSU, 2013)**

***Pinus***

**Write two xerophytic characters of *Pinus*.**

**Comment on the morphological nature of the ovuliferous scale of *Pinus*. (WBSU, 2013)**

***Gnetum***

**State the angiospermic characters of *Gnetum*.( WBSU, 2014)2**

**State the angiospermic characters of the female gametophyte of *Gnetum*.**

**Mention the gymnospermic characters of *Gnetum*.**

**Economic uses**

**Mention the uses of gymnosperm as drug.**

**Name one resin and one essential oil producing gymnosperm plants.**

**Give the scientific names of the plants producing essential oil and Taxol.( WBSU, 2013)**

**What is Canada balsam? Name the gymnospermic plants from where it is obtained. (WBSU, 2014)**