UNISA university of south africa
University Examinations

DEPARTMENT OF LIFE AND CONSUMER SCIENCES

Plant Structure

BOT1501

Semester I: Assignment no. 2 Memorandum

2017

QUESTION 1

1.1 **Primary growth** is the production of new primary tissues at root and shoot tips by primary meristems. This type of growth increases the height or length of shoots or roots.

Secondary growth is the production of new plant tissues by secondary meristems (vascular and cork cambia). Secondary growth influences the growth by increasing the girth of woody plants.

1.2 **Taproot:** has a large main root that usually penetrates deeply into the soil to ‘tap” deep sources of water. It develops directly from the radicle and produces branch roots called lateral roots. Eg. Most dicots and gymnosperms, like dandelion, carrot

Fibrous roots: Numerous roots that develop from the lower part of the stem, replacing the embryonic root (radicle). These roots are called adventitious roots. No single root stands out as the largest. The root system is shallower and more horizontal. eg seedless vascular plants and most monocots, like maize

1.3 **Heartwood** is the older, non-conducting rings of xylem that form the centre of the trunk or root. It is no longer involved in transport of water and minerals. It is often darker in colour due to deposits of resin, gum and other compounds.

Sapwood is the newer, outer rings of xylem that actively transport the xylem sap.

1.4 **Simple fruits:** arise from the ovary (carpel or fused carpels) of one flower. Eg. Berries

Multiple fruits: develop from the carpels of more than one flower in a single inflorescence. Eg pineapples and figs

1.5 **Pericycle:** Encircles the stele and consists of meristematic cells that give rise to lateral roots, also called branch roots.

Endodermis: Regulates the flow of substances between the cortex and the vascular tissue.

1.6 **Bottleneck effect** is the genetic drift resulting from the reduction of a population, typically by a natural disaster, to such an extent that the surviving population is no longer genetically representative of the original population.

Genetic effect is inheritable changes, chiefly mutations, produced by the absorption of ionizing radiations. The result of exposure of substances-e.g. radiation that cause damage to the genes of germinal cells-i.e. sperm or egg.

[6 × 4=24]

QUESTION 2

2.1 **Choose any three of the following symbiosis**

Commensalism – interaction between two species in which one benefits while the

other is unaffected.

Mutualism – interaction where both species benefit.

Predation – one organism feeds on and kills another organism.

Herbivory – an animal feeds on a plant but usually does not kill it.

Parasitism – one organism feeds on another that is still alive. **[3×3=9]**

2.2 a) Haustoria – root- is a parasite, which extracts carbohydrates from tissues of living host, harming it in a process.

b) Rhizome – Stem- underground stem which new leaves and shoots develop.

c) Stipule – leaf- serves as defense against herbivores. **[3 × 2 =6]**

2.3

	MITOSIS	**MEIOSIS I**	**MEIOSIS II**
Prophase	After replication, Chromosomes appear as a pair of two sister chromatids	After replication, Homologous chromosome pair up and are held together by chiasma. Rearrangement of genetic material	Chromosomes, each composed of two chromatids associated at centromere, move towards the metaphase plate.

		occurs between non-sister chromatids (crossing over)	
Metaphase	Chromosomes line up individually at the metaphase plate.	Chromosomes are positioned on the metaphase plate as pairs of homologs, rather than individual chromosomes,	Chromosomes positions on the metaphase plate, because of the crossing over in Meiosis 1, the two sister chromatids of each chromosome are not genetically identical.
Anaphase	Sister chromatids separate and move towards opposite ends of the cell. By the end of anaphase, the two ends of the cell have equivalent and complete collections of chromosomes.	Homologs separate and sister chromatids remain attached at centromere.	Chromatids separate and move towards opposite ends as individuals.
Telophase	Two daughter nuclei form in the cell, nuclear envelop arise and division of the cytoplasm follows, resulting in two daughter cells which are genetically identical to the parent.	Each half of the cell has a complete haploid set of replicated chromosomes, each composed of two sister chromatids. One or both chromosomes include regions of non-sister	The end product from one parent cell is 4 daughter cells, each genetically distinct from the others and from the parent.

		chromatid DNA.	

(16)

2.4. Plants:

- are multicellular (they undergo a life that takes them through alternation of generations.
- are photosynthesis eukaryotic .
- are autotrophs (Chloroplast: *chlorophylls a & b*) [let's credit student on this one though it is similar to the above characteristic].
- have cell walls with cellulose.
- store food as starch.
- are fixed in one place (they do not move).
- Possess roots and leaves. **(5×2=10)**

  Any five characteristics from above

QUESTION 3

3.1 ***Any five of the following modified roots***

Modified root name	Structure	Function
1. Prop roots	✓ develop from the branches and eventually reach the ground	✓ They support the tall, top-heavy tree
2. Storage roots	✓ often grow underground, where they are better protected from attack by herbivores	✓ To store water and food
3. Strangling aerial roots	✓ grow above the ground	✓ To anchor on other trees
4. Buttress roots	✓ are large roots on all sides of a shallowly rooted tree	✓ Give architectural support to the trunks of such trees
5. Pneumatophores	✓ grow into vertical branches with	✓ They enable the root system to obtain oxygen

	openings allowing entry of atmospheric oxygen	
6. Contractile roots	✓ Contract by spiraling to pull the plant a little deeper into the soil	✓ Pull the plant a little deeper into the soil
7. Parasitic roots	✓ Peglike roots called haustoria that penetrate the host plants around which they are twined.	✓ Penetrate the host plants and withdraw nutrients

(20)

3.2 **Dermal tissue system**: is the **outer protective layer** which covers the entire body of a plant. It **protects the organ (leaf/stem/root) against physical damage, desiccation and pathogenic organisms.** The dermal tissue of non-woody plants usually consists of a single layer of tightly packed cells called the epidermis. In woody plants, the epidermis is replaced by the **periderm** which mainly consists of non-living cork cells.

Vascular tissue system: consists of two vascular tissues, i.e. **xylem** and **phloem**, that are responsible for carrying out long distance transport of materials between roots and shoots. It is continuous throughout the plant but is arranged differently in each organ.

The xylem **conveys water and minerals upwards from roots to shoots** and the phloem **transports organic nutrients from where they are made to where they are needed**. The xylem is composed of tracheids and vessel elements, the latter occurring in most flowering plants and some gymnosperms. Both the tracheids and vessel elements are dead at maturity. The phloem of flowering plants

Ground tissue system: consists of tissues that are neither dermal nor vascular. It includes the **parenchyma**, **collenchyma** and **sclerenchyma** tissues that are specialised for functions such as **storage, photosynthesis and sup**port. The pith is the ground tissue found internal to the vascular tissue while the cortex is external to the vascular tissue. **(15)**

Total 100 marks

*******The End*******