

DEPARTMENT OF LIFE AND CONSUMER SCIENCES

Plant Biodiversity and Environmental Botany

BOT1502

SEMESTER II

Assignment no.2

2018

Memorandum

QUESTION 1

1.1 Survivorship curves show how the death rate in a population correlates with age.

Survivorship curve I: The death rate is very low for young and middle-aged individuals but increases sharply in old age.

Survivorship curve III: The death rate is very high in the young and very low in middle-aged and old individuals. (5)

1.2 Primary succession: describes changes in communities over time in areas that are initially devoid of almost all life and where soil has not yet formed.

Secondary succession: takes place where a community has been removed by disturbance but the soil remains intact. (5)

1.3 UNCCD: United Nations Convention to Combat Desertification- Composed of the international community, recognized that desertification is a major economic, social and environmental problem of concern to many countries in all regions of the world and developed integrated approach to the problem, emphasizing action to promote sustainable development.

CBD: Convention on Biological Diversity -Signed by 150 government leaders, the Convention is dedicated to promoting sustainable development. It is a practical tool for translating the principles of Agenda 21 into reality, the Convention recognizes that biological diversity is about more than plants, animals and micro-organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. (5)

1.4 r- type selection: traits that maximise the reproductive rate of populations in uncrowded environments. Characterised by a short life span and often high death rate

k-type selection: traits that enable individuals to compete successfully for resources and to use resources efficiently. They produce only a few off-springs and have adaptations that increase the likelihood that each offspring will survive. (5)

[20]

QUESTION 2

2.1 Explain the differences between indigenous, exotic and invader plants.

Answer:

Indigenous plant; species naturally occurring or originating in a geographical region since prehistorically time

Exotic plant: is a plant that is not native to the place or area where it is considered introduced.

Invader plant: Invasive plants are species that show a tendency to spread out of control

(Students should elaborate further to obtain full marks) (12)

2.2 Conservation of Agricultural Resources ACT (ACT 43 of 1983)

The objective of this act is to provide for the conservation of the natural agricultural resources of the republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water source, and by the protection of the vegetation and the combating of weeds and invader plants.

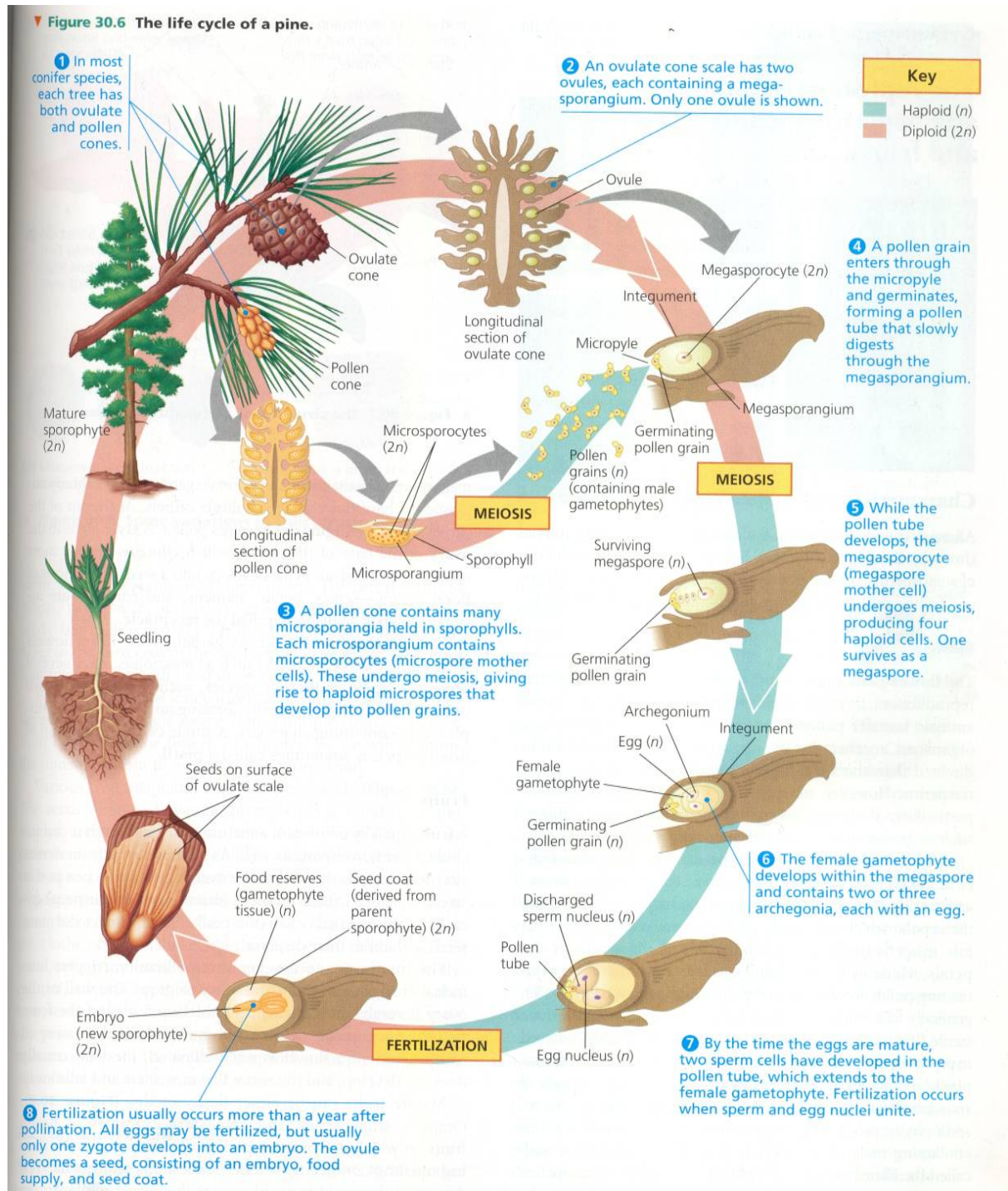
Declared weeds and Alien Plants are divided into three categories:

Category 1 plants: This is the strictest category that includes declared weeds. These are prohibited plants that will no longer be prohibited on land or on water surface, neither in rural or urban areas. These plants may not occur on any land or inland water surface other than in a biological control reserve. Except for the purpose of establishing a biological control reserve, one may not plant, maintain, multiply or propagate such plants, import or sell or acquire propagating material of such plants except with the written exception from executive officer.

Category 2 plants: These plants with a proven potential of becoming invasive, but which nevertheless have certain beneficial properties that warrant their continued presence in certain circumstances. These are plants with a commercial application and may only be grown in demarcated areas (or biological reserves)

Category 3 plants: These plants are undesirable because they have proven potential of becoming invasive, but most of them are nevertheless popular ornaments or shade trees that will take long time to be replaced. Propagative material of these plants, such as seeds or cuttings may no longer be planted, propagated, imported, bought, sold or traded in anyway. The regulations regarding these plants are the same as from category 1, except that plants already in existence at the time of the commencement of these regulations are exempt, unless they occur within 30 metres of 1:50 year flood line of river, stream etc. **(10)**

2.3 See figure 22.14 (page 413, Plant Biology 2nd edition, 2006) or figure 14 (Page 471, Plant Biology New International edition, 2014).



QUESTION 3

3.1 GMO Advantages (Any five of the following)

- ✓ More nutritious-add nutritional value to crops that lack necessary vitamins and nutrients.
- ✓ Less pesticide is needed to be used due to insect pest resistant plants.
- ✓ Higher crop yields.
- ✓ Decrease in costs of growing and farming, due to the reduced use of pesticides.
- ✓ Less starvation in the world due to decreased food prices.
- ✓ Higher resistance to diseases.
- ✓ More economically friendly.

GMO Disadvantages (Any five of the following)

- ✓ Harm to other organisms.
- ✓ Tastes of GMOs are not as good or "natural".
- ✓ GMOs may cause health problems.
- ✓ Possible damages to the environment.
- ✓ Allergies may become more intense, and also, new allergy types may develop.
- ✓ Spread of new, more resistant "super weeds".
- ✓ Additional costs of labelling whether products are GMOs or not. This might increase costs of foods.
- ✓ Unharmonized test-and safety standards around the world. (10)

3.2 Ozone is an important atmospheric gas owing to fact that it absorbs UV radiation, and it prevents high levels of UV light from reaching the surface. Ozone depletion has its greatest effects by increasing the atmospheric transmission of solar UV-B radiation. It is Excess UV-B exposure of non-acclimated plants impairs all of the main processes of leaf photosynthesis particularly photosystem II.

Ozone consists of three atoms of oxygen bound together (O_3), Most of the atmosphere's ozone occurs in the region called the stratosphere. This layer filters out incoming radiation in the "cell-damaging" ultraviolet (UV) parts of the spectrum.

- Excessive UV radiation has been shown to inhibit the growth processes of almost all green plants.
- There is concern that ozone depletion may lead to a loss of plant species and reduce global food supply.
- Tests have shown that some varieties of crops are sensitive to increased UV-B exposure and it could cause a reduction in yield.
- Research to date suggest that ultraviolet light can cause changes in the molecules of plants, such as those that control growth regulation and this could mean smaller plants, different flowering times and problems for the pollination cycle.
- UV radiation affects plants growth by reducing leaf size and limiting the area available for energy capture during photosynthesis. Plants stunting and reduction In total dry weight are also typically seen in UV-irradiated plants, with a reduction in the nutrient content and

growth of the plants, especially the pea and cabbage families. A reduction in observed. Forests also appear to be vulnerable. About half of the species of conifer seedlings so far studied have been adversely affected by UV radiation. Although old needles are able to protect. (10)

3.3 A driver is any natural or human-induced factor that directly or indirectly causes a change in an ecosystem. A direct driver unequivocally influences ecosystem processes and can therefore be identified and measured to differing degrees of accuracy. An indirect driver operates more diffusely, often by altering one or more direct drivers, and its influence is established by understanding its effect on direct drivers.

The indirect drivers of change are primarily demographic, economic, socio-political, scientific and technological, and cultural and religious. The interaction of several of these drivers in turn affects the overall level of resource consumption and disparities in consumption within and between countries. Clearly these drivers are changing: population and the global economy are growing, there are major advances in information technology and biotechnology, and the world is becoming more interconnected. Changes in these drivers are projected to increase the demand for food, clean water, and energy, which will in turn affect the direct drivers. The direct drivers are primarily physical, chemical, and biological, such as land cover change, climate change, air and water pollution, irrigation, use of fertilizers, harvesting, and the introduction of alien invasive species. National government mitigation plans/measures are aimed at eliminating, offsetting, or reducing adverse environmental impacts and could have a range of objectives, such as:

Avoidance: Avoiding projects or activities that could result in adverse impacts; avoiding certain types of resources or areas considered to be environmentally sensitive. This approach is most effective when applied in the earliest stages of project planning.

Prevention: Measures aimed at preventing the occurrence of negative environmental impacts and/or preventing such an occurrence having harmful environmental and social impacts. Preservation: Preventing any future actions that might adversely affect an environmental resource. This is typically achieved by extending legal protection to selected resources beyond the immediate needs of the project.

Minimisation: Limiting or reducing the degree, extent, magnitude or duration of adverse impacts. This can be achieved by scaling down, relocating, or redesigning elements of a project. Rehabilitation: Repairing or enhancing affected resources, such as natural habitats or water sources, particularly when previous development has resulted in significant resource degradation.

Restoration: Restoring affected resources to an earlier (and possibly more stable and productive) state, typically a 'pristine' condition. Compensation: Creation, enhancement, or protection of the same type of resource at another suitable and acceptable location, compensating for lost resources. It should be noted that compensation may be a suitable mitigation measure for certain impacts of certain projects, but is often not a sustainable measure to implement. (10)

QUESTION 4

Explain briefly (word or two) how each of the following is accomplished:

4.1 Osmoregulation and excretion in the Dinophyta

Pusule, a sac- like structure with a firm wall that opens by means of pores. Its contents are released directly into the groove and from there to the outside when the Pusule contracts. (2)

4.2 Movement of diatoms

Possess **two flagella** that lie within two grooves in the plates. The flagella's beating in the grooves causes the cell to spin and move forward. (3)

4.3 Re-establishment of cell in the Bacillariophyta.

The accumulation of silica in their frustules gives diatoms a density approximately 2 and half times that of sea water. They also store oil and vary their density by producing or using oil.

OR

After mitosis, each daughter cell inherits half of the parental cell's frustules and then manufacture the missing half. The newly manufactured half fits inside the half that came from the parental cell. The daughter cell will be the same size as the parent. (2)

4.4 Conjugation in Spirogyra.

Achieved by means of **conjugation tube** that connects opposite cells and allow gametes to move through to the other gametes where fertilization takes place, in the conjugation tube. (3)

4.5 Feeding in heterotrophic Euglenophyta.

Ingest and /or **absorb organic molecules**. (3)

4.6 Detection of light intensity in Euglena and Chlamydomonas.

They have a **light detector** near the base of the flagella. They swim towards light. (2)

(15)

"End of Memorandum"