UNISA university of south africa

DEPARTMENT OF LIFE AND CONSUMER SCIENCES

Plant Biodiversity and Environmental Botany

BOT1502

SEMESTER 1

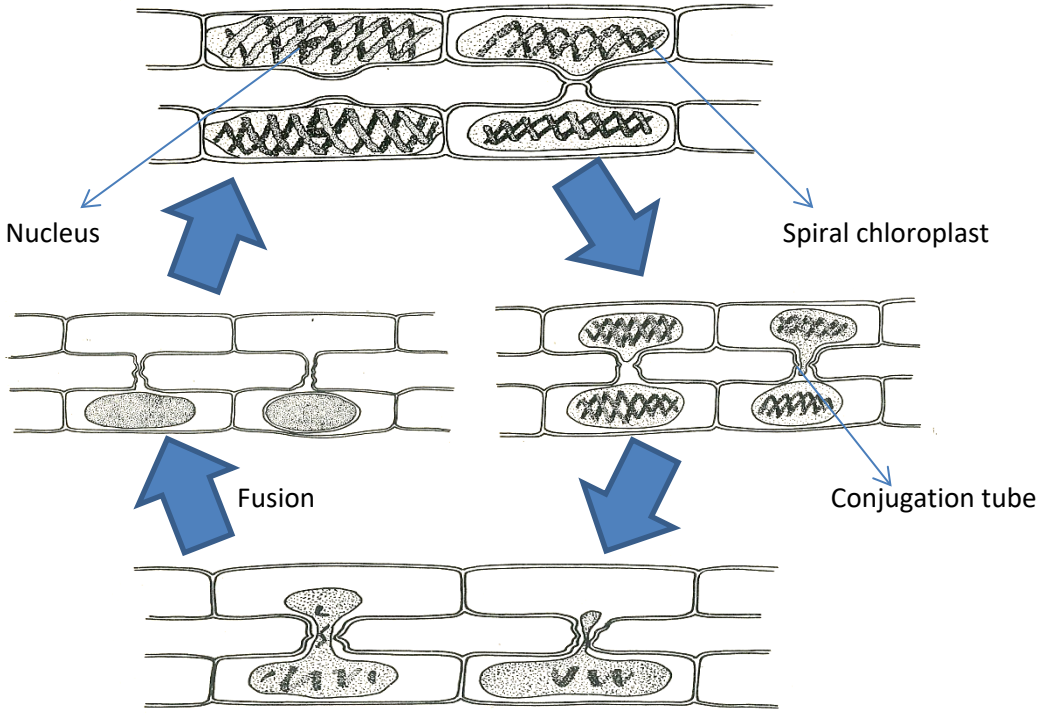
Assignment no.2

2018

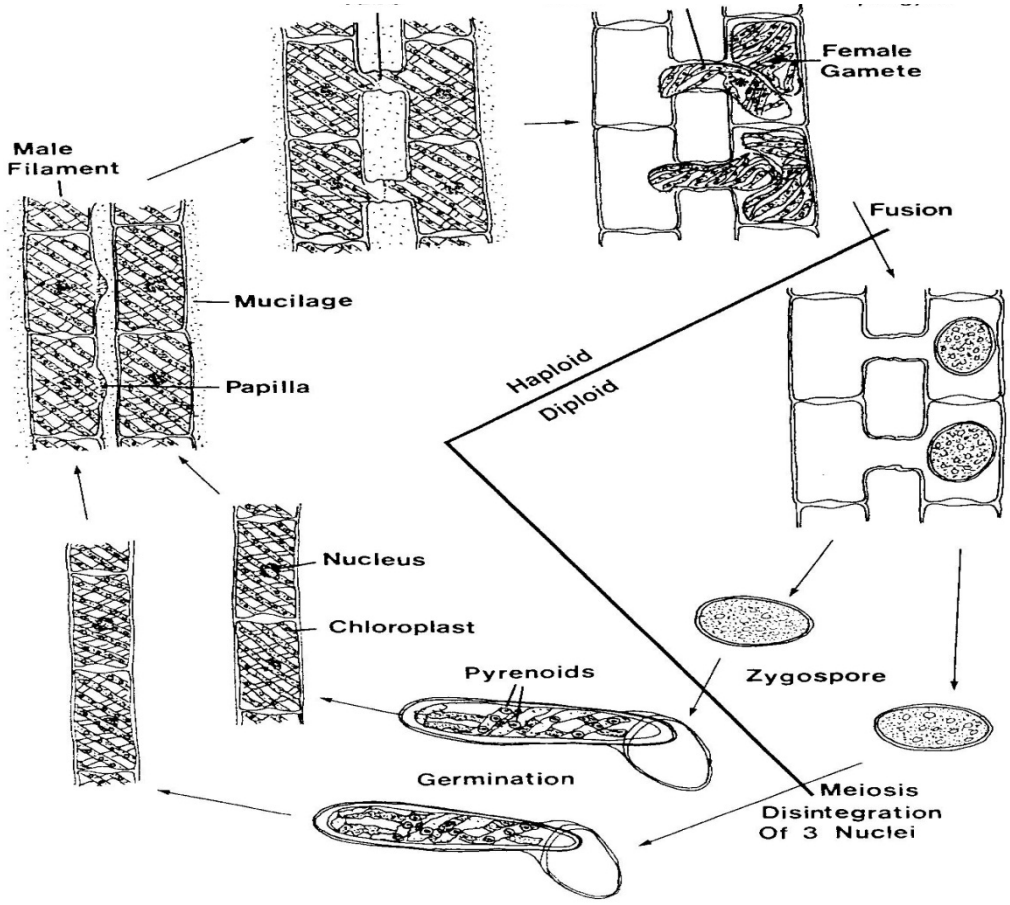
Memorandum

QUESTION 1

1.1



OR



Labelled diagram showing the process of conjugation in *Spirogyra (See page 338, Graham et al., 2014; New International edition)* **(10)**

1.2 Advantages of algae (**any 4**)

1. Algae form the basis of the aquatic food chain.
2. Algae are an important source of food for humans and animals.
3. Algae yield a large variety of substances that can be used industrially, commercially and domestically.
4. Algae yield compounds that are used in medicines.
5. Because algae are rich in nutrients, they can be used as fertiliser.

Disadvantages of algae

1. Algae may obstruct the gills of fish and cause their death.
2. Blooms impart smells and tastes to the water and increase the cost of water purification.
3. Some algae and cyanobacteria may secrete toxic compounds that can poison humans and animals.
4. The decomposition of algae may lead to oxygen depletion, causing fish deaths. **(8)**

1.3 **Terrestrial biomes** (further reading: from page 483-509 Plant Biology, 2nd edition or 530-581-New International edition)

a) Tropical forests
- ✓ More than 200 cm annual rainfall with warm-hot temperatures year-round.
- ✓ Thin soil cannot support continued cropping, and cannot resist erosion.
- ✓ Rapid decomposition and nutrient cycling.

b) Deserts
- ✓ Characterized by low moisture levels and precipitation that is infrequent and unpredictable from year to year.
- ✓ Wide daily and seasonal temperature fluctuations.

c) Chaparral/Mediterranean
- ✓ Hot, dry summers and cool, moist winters.
- ✓ Fires common component of landscape.

d) Savannas
- ✓ Communities of grasses, seasonal herbaceous flowering plants, and open savannas.
- ✓ Large daily and seasonal temperature fluctuations.
- ✓ Frequent grass fires.

e) Tundra
- ✓ Short growing season.
- ✓ Treeless, frigid plain found in the very northern regions.
- ✓ Water locked up much of the year.
- ✓ Low biological productivity, low diversity, and low resilience

f) Taiga/Coniferous forest
- ✓ Needle-like leaves with waxy coatings

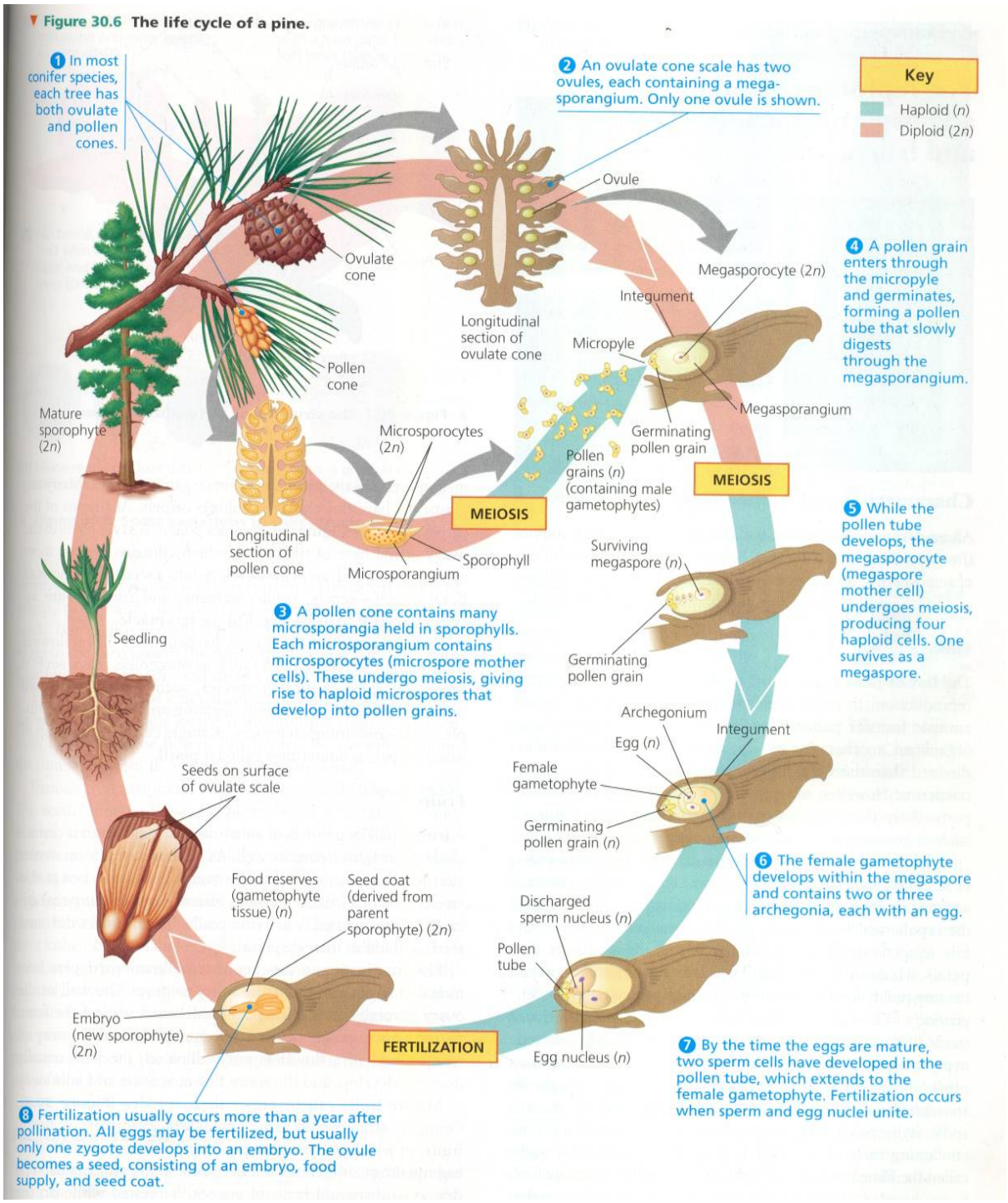
g) Temperate deciduous forest
- ✓ Occur throughout the world where rainfall is plentiful.
- ✓ Deciduous trees shed leaves when water is scarce or ground is frozen

h) Grasslands

✓ Typically found in regions with flat or rolling terrain and have grass as their major form of vegetation. **(12)**

QUESTION 2

2.1 **<u>See figure 22.14 (page 413, Plant Biology 2nd edition, 2006) or figure 14 (Page 471, Plant Biology *New International edition, 2014)*.</u>**



(15)

2.2 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)**

2.3 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. **(5)**

2.4 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 3

3.1 **r-selected population** it is characterised by a short life span and often high death rate. Possess traits that maximise the reproductive rate of population in unstable environment.

K-selected population In stable or predictable environments, K-selection predominates as the ability to compete successfully for limited resources is crucial and populations of K-selected organisms typically are very constant and close to the maximum that the environment can bear (unlike r-selected populations, where population sizes can change much more rapidly). **(5)**

3.2 a) Interactions in which at least one species benefits.
Commensalism – interaction between two species in which one benefits while the other is unaffected; and
Mutualism – interaction where both species benefit.

b) Interactions in which at least one species is harmed.
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. **(10)**

3.3 The carbon cycle is the biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere, and atmosphere of the Earth. Carbon is

present in the atmosphere in the form of the gas carbon dioxide (CO_2). All organisms must have a source of carbon because all of the organic molecules essential for life are built of carbon.

Carbon in the earth's atmosphere exists in two main forms: carbon dioxide and methane. Both of these gases absorb and retain heat in the atmosphere and are partially responsible for the greenhouse effect. Methane produces a large greenhouse effect per volume as compared to carbon dioxide, but it exists in much lower concentrations and is more short-lived than carbon dioxide, making carbon dioxide the more important greenhouse gas of the two.

Carbon dioxide leaves the atmosphere through photosynthesis, thus entering the terrestrial and oceanic biospheres. Carbon dioxide also dissolves directly from the atmosphere into bodies of water (oceans, lakes, etc.), as well as dissolving in precipitation as raindrops fall through the atmosphere. When dissolved in water, carbon dioxide reacts with water molecules and forms carbonic acid, which contributes to ocean acidity. It can then be absorbed by rocks through weathering. It also can acidify other surfaces it touches or be washed into the ocean.

Human activity over the past two centuries has significantly increased the amount of carbon in the atmosphere, mainly in the form of carbon dioxide, both by modifying ecosystems' ability to extract carbon dioxide from the atmosphere and by emitting it directly, e.g. by burning fossil fuels and manufacturing concrete.

Carbon leaves the terrestrial biosphere in several ways and on different time scales. The combustion or respiration of organic carbon releases it rapidly into the atmosphere. It can also be exported into the oceans through rivers or remain sequestered in soils in the form of inert carbon. Carbon stored in soil can remain there for up to thousands of years before being washed into rivers by erosion or released into the atmosphere through soil respiration. Between 1989 and 2008 soil respiration increased by about 0.1% per year. In 2008, the global total of CO_2 released from the soil reached roughly 98 billion tonnes, about 10 times more carbon than humans are now putting into the atmosphere each year. There are a few plausible explanations for this trend, but the most likely explanation is that increasing temperatures have increased rates of decomposition of soil organic matter, which has increased the flow of CO_2. The length of carbon sequestering in soil is dependent on local climatic conditions and thus changes in the course of climate change. **(15)**

(See page 524-25 for Carbon cycle diagram as well as compressive notes)

TOTAL: 100 marks

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