Organisms & Ecology Concept List

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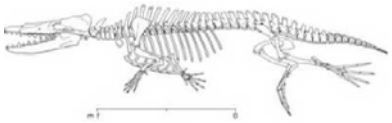

Course title:

Institution:

Semester:
Year:
Instructor:

Are you / where you...

- ❑ **The instructor of the course**
- ❑ **A teaching assistant in the course**
- ❑ **A student taking the course**

While not exhaustive (and we would appreciate it if you would concept statements below if you cover them and they are not listed), the list will enable you to make explicit to yourself, your teaching assistants and your students, which concepts you intend to cover.

It will also enable your teaching assistants (and students) to indicate what concepts they thought you covered.

Concept statements you should add to your list:

We would very much like to get a copy of your list, since this list can be more informative than the typical syllabus. Please mail or email it to us at
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CONCEPT STATEMENT AREA	emphasized	Mentioned	Not covered
Life Cycles – 15 statements			
	❑	❑	❑
1. The **life cycle** of an organism begins with its appearance and ends with its death.	❑	❑	❑
2. The simplest of life cycles are **asexual** and involve a process of fission, budding or fragmentation such that each offspring receives a complete copy of the **genome** plus necessary cytoplasmic organelles, such as the chloroplasts and mitochondria of eukaryotes.	❑	❑	❑
3. A version of an asexual life cycle involves the formation of **alternative vegetative state**, such as a **spore**. Spores are passive (non-reproducing) but under appropriate conditions can give rise to normally dividing organisms.	❑	❑	❑
4. In an **asexual organism**, changes to the genome can occur only through mutation or **horizontal gene transfer**.	❑	❑	❑
5. The process of sex involves **genetic recombination** between two (or more) distinct organisms. In the most common form, sex involves the fusion of gametes from two distinct individuals.	❑	❑	❑
6. **Gametes** are haploid cells; typically gametes can fuse through the process of **syngamy/fertilization** to form a diploid cell.	❑	❑	❑
7. In organisms with a **haplontic life cycle**, the diploid (**sporophytic**) phase is transient and mitosis only occurs in the haploid (**gametophytic**) phase.	❑	❑	❑
8. In organisms with a **haplodiplontic life cycle**, mitosis can during either the haploid or the diploid phase of the life cycle.	❑	❑	❑
9. Most animals are **diplontic**. Mitosis occurs only in the diploid phase of the life cycle and the haploid gametophytic phase is transient ending in fertilization or death.	❑	❑	❑
10. The **germ line** of an organism gives rise to **germ cells**, which in turn produce the gametes and supporting cells.	❑	❑	❑

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Life Cycles – continued			
11. In many animals, the germ cells arise in one location and migrate to the male (**testes**) and female (**ovary**) sexual organs. Testes produce **sperm** while ovaries produce **eggs**, both of which produce haploid pronuclei that fuse to form a diploid nucleus.	❑	❑	❑
12. Gametes can be similar in size (**isogamous** organisms) or very different (**anisogamous**). It is conventional to call the individual that produces the larger gametes (eggs) female and the smaller gametes (sperm) male.	❑	❑	❑
13. The egg contains the bulk of the cytoplasm present in the new diploid organism formed upon fertilization. In particular, it is common that **mitochondria** are supplied only by the egg.	❑	❑	❑
14. Eggs are typically non-motile, sperm motile.	❑	❑	❑
15. A number of different mechanisms are used to insure that an egg is fertilized by only a single sperm; fertilization of an egg by multiple sperm generally leads to severe developmental abnormalities.	❑	❑	❑
Ecology Basics – 7 statements			
1. Ecology is the study of the inter-relationships between organisms and their environment. It includes how organisms are impacted by their environment and how they, in turn, impact their environment.	❑	❑	❑
2. The major source of energy that flows through ecological systems is the sun. This energy is captured primarily through photosynthesis. Additional sources of energy are found in chemicals.	❑	❑	❑
3. A number of different approaches are used to characterize ecological processes. The **trophic-dynamic concept**, tracks **energy flow** through populations, communities, ecosystems and the entire globe.	❑	❑	❑

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Ecology Basics – continued			
4. The **biogeochemical cycle concept**, tracks **materials and elements** through populations, communities, ecosystems and the entire globe.	❑	❑	❑
5. Ecological interactions can occur at the level of individuals, populations and communities. Such interactions include symbiosis, competition, predation, succession, and stability.	❑	❑	❑
6. Population dynamics are a complex function of environmental factors, organismic behavior and fecundity, predation, pathogenesis, and cooperation (interorganismic and intrapopulation interactions).	❑	❑	❑
7. Much of what is meant by the term **natural selection** can be best understood in terms of ecological interactions and principles.	❑	❑	❑
Symbionts and Pathogens– 7 statements			
1. There is a multidimensional continuum between organisms. It varies from organisms that live in close proximity but have discernable effect on one another, to organisms that benefit or suffer as a result of their interactions.	❑	❑	❑
2. Some interactions between organisms are transient, for example predator/prey or host/pathogen. Other relationships are permanent or prolonged; these are known as symbiotic relationships.	❑	❑	❑
3. Symbiotic relationships can be characterized in terms of benefit and cost to each of the organisms involved. **Mutualism** indicates that both organisms benefit; **Commensalism** involves benefit to one but no serious harm to the other; **Amensalism** involves harm to one but no significant benefit to the other while **Parasitism** involves benefit to one and significant harm to the other.	❑	❑	❑
4. We can think of the pathogen/host relationship as an extreme form of parasitism, cut short by the death of the host or the elimination of the pathogen by the host's immune system.	❑	❑	❑
5.There are many modern examples of **endosymbiosis**, in which one organism lives within the confines of the cells of another.	❑	❑	❑

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Symbionts and Pathogens– 7 statements			
6. The function of the **immune system** is to recognize foreign organisms and viruses and to eliminate them from the host's body.	❑	❑	❑
7. The immune system does not always function perfectly, or it may over-react to a benign organism or situation -- this can lead to **autoimmune disease**.	❑	❑	❑
Carbon Cycles - 14 statements			
1. Carbon moves through and between ecosystems as CO2 (low energy) and reduced (high energy) organic (carbon-containing) molecules.	❑	❑	❑
2. One class of organisms, known as primary producers or autotrophs, transforms CO2 into reduced organic molecules; this process requires energy.	❑	❑	❑
3. Energy enters ecosystems primarily as sunlight (electromagnetic energy). The process by which autotrophs use light is used to generate reduced CO2 is known as photosynthesis.	❑	❑	❑
4. The most common form of photosynthesis, the form used by most photosynthetic bacteria and plants, involves the light-driven extraction of electrons from water; these electrons are used to generate reduced CO2. A by-product of this reaction is O2.	❑	❑	❑
5. Organisms that cannot use energy to generate reduced CO2 are known as heterotrophs. Heterotrophs require a source of reduced CO2 to survive and grow. They obtain this reduced CO2 by eating other organisms or the by-products of other organisms.	❑	❑	❑
6. During aerobic respiration energy is extracted from reduced CO2 by the removal of elections; these electrons are delivered to O2 to form H2O.	❑	❑	❑
7. Aerobic heterotrophs (animals, fungi, non-photosynthetic, non-autotrophic bacteria and archaea) take in organic molecules and O2 and release CO2.	❑	❑	❑
8. Methanogenic heterotrophs (archaea) take in organic molecules and release CH4; Methanotrophic heterotrophs oxidize CH4 to form CO2.	❑	❑	❑

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Carbon Cycles - continued			
9. Aerobic autotrophs perform both photosynthesis in the light and respiration (all the time).	❑	❑	❑
10. Reduced organic molecules. ATP and related molecules carry energy around within the cell.	❑	❑	❑
11. Carbon moves between organisms and between the cells within an organism (via the circulatory system if an organism has one) as CO2 or organic molecules (food and to a lesser extent, waste).	❑	❑	❑
12. The total amount of reduced organic molecules present within organisms is know as biomass.	❑	❑	❑
13. Autotrophs move carbon in and out of the biomass (with generally a net increase), while heterotrophs move it out (with a net decrease).	❑	❑	❑
14. The atmosphere and oceans contain pools of CO2, pools of reduced carbon are found in buried sediments, in rocks, dissolved in the ocean, and as methane hydrates.	❑	❑	❑

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