Evolution & Genetics Concept List

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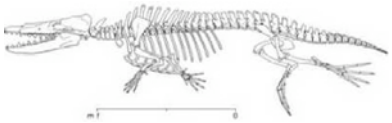

Course title:

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
Origins and Ancestors – 7 statements			
1. There is a continuous uninterrupted line of descent from the first organisms that arose ~3.5 billion years ago to all presently living organisms.	❑	❑	❑
2. The spontaneous generation of living organisms does not occur in the modern world, but did occur on the early earth.	❑	❑	❑
3. Based on several structural and molecular traits, organisms can be divided into three distinct 'kingdoms': **bacteria**, **archaea** and **eukarya**.	❑	❑	❑
4. All presently living organisms arose by the processes of variation and selection from a common ancestor that lived more than 3 billion years ago.	❑	❑	❑
5. Modern eukarya are descended from hybrid organisms, which arose originally from the combination of a bacterial and a non-bacterial cell.	❑	❑	❑
6. Modern multicellular plants (**metaphyta**), **fungi**, and animals (**metazoa**) arose independently from eukaryotic ancestors.	❑	❑	❑
7. All metazoa appear to be descended from a common ancestor that lived around ~1.5 billion years ago.	❑	❑	❑
Evolution Basics – 9 statements			
1. The **fossil record** provides direct evidence for the **evolution** of life on earth	❑	❑	❑
2. Evolution occurs in **populations** of **interbreeding** organisms.	❑	❑	❑
3. A molecular analysis of the **genomes** (genetic material) of organisms provides evidence for the evolutionary relationships between organisms.	❑	❑	❑
4. The establishment of barriers to interbreeding can produce a selective advantage by preserving adaptations.	❑	❑	❑
5. **Speciation** occurs when members of two populations can no longer interbreed successfully.	❑	❑	❑
6. Evolution is based on genetic variation and **superfecundity**, which leads to changes in genetic composition over time.	❑	❑	❑
7. Without **mutations** there would be no evolution.	❑	❑	❑

Evolution Basics - continued			
8. Random events, such as **genetic drift**, **founder effects** and **genetic bottlenecks**, can influence evolutionary change.	❑	❑	❑
9. Non-random mating behavior, known as **sexual selection**, can influence evolutionary change.	❑	❑	❑
Alleles Mutations and Phenotypes – 14 statements			
1. Genes can exist in different versions, which differ in the nucleotide sequence; these versions are known as alleles.	❑	❑	❑
2. The complete set of genes carried by an organism is its genome; the specific set of alleles it carries is known as its genotype.	❑	❑	❑
3. The specific features of an organism are known as its phenotype.	❑	❑	❑
4. The phenotype is a function of the genotype and environmental and molecular events that occur during embryonic development and thereafter.	❑	❑	❑
5. Some phenotypic traits are due to the allelic composition of a single gene, most are based on a large number of different genes.	❑	❑	❑
6. During meiosis the process of recombination can lead to the formation of new alleles and new combinations of alleles along a chromosome.	❑	❑	❑
7. The process of sexual reproduction can generate vast numbers of possible genotypes.	❑	❑	❑
8. All alleles have their origins as a **mutation** or a recombination event. The original version of the gene, before the mutation, is known as the **wild type** allele.	❑	❑	❑
9. A specific gene is also known as a **genetic locus** (position). In a particular population of organisms, the number and frequency of alleles of a specific genetic locus will be determined by various factors, including founder effects, genetic drift and natural selection. Generally the most frequent allele will be considered the wild type, but this is an artificial convention.	❑	❑	❑

Alleles Mutations and Phenotypes - continue			
10. Genes produce products, either RNAs or (indirectly) polypeptides (proteins).	❑	❑	❑
11. A mutation can alter either the gene product itself, its regulation (when, where and how much is produced).	❑	❑	❑
12. We can classify mutations formally, without even knowing what the gene products do or how the mutation alters them in the following terms. A mutation can be **amorphic** (no gene product produced), **hypomorphic** (the gene product has the same function, but is less active than the wild type),**hypermorphic** (the gene product has the same function, but is more active than the wild type), **antimorphic** (the mutant gene product antagonizes the function of the wild type product) or **neomorphic** (the gene product has a new function, different from the wild type gene produce).	❑	❑	❑
13. **Haploid** organisms have a single copy of each genetic locus. **Diploid** organisms have two copies (one inherited from the **maternal parent** the other from the **paternal parent**). In a diploid organism, if a phenotypic trait is determined by one allele, irrespective of the nature of the other allele at the genetic locus, the determining allele is said to be **dominant,** the other allele(s),**recessive**.	❑	❑	❑
14 Most alleles are neither strictly dominant nor recessive, but interact in complex ways with each other and the rest of the genotype to determine phenotype.	❑	❑	❑