Evolutionary Biology course, 10p (BIO720), 2004

Preconceptions…….

All students come to classes with preconceptions about how the world works. Recent research on students' conceptual misunderstandings of natural phenomena indicates that new concepts cannot be learned if alternative models that 'explain' a phenomenon already exist in the learner's mind. Specifically, there is strong evidence that prior conceptions often underpin students' misunderstanding of the evolutionary concepts being taught. This suggests that I as a teacher /instructor should provide situations in which you are able to examine the adequacy of your prior conceptions, allowing you to argue about and test them in an interactive learning process. To be able to do that, however, I need to know what (if any) pre- and misconceptions you have. I have therefore listed a number of statements below. I want you to indicate at the end of each statement if you think it is true or false by marking one of the boxes with an X.

Note that I will not use your answers to assign a grade to your achievements (given that the course commences today). Despite that, I do want you to write your name on this form. The reason is that you will answer the same list of statements at the very last day of the course and you will not be able to compare your answers before and after unless you have identified yourself.

Good luck/
Anders Forsman

My name is:……..

1. Because evolution is a long-term process it cannot be observed or explained by processes that we can investigate during short scientific investigations. **True** ❒ **False** ❒

2. Adaptations are the result of the combined effects of natural selection or random changes (such as drift) in allele frequencies. **True** ❒ **False** ❒

3. Natural selection is operating when there is a correlation (association) between variation in a morphological, physiological or behavioural trait and the variation in reproductive success among individuals within a population. **True** ❒ **False** ❒

4. Random (or neutral) evolutionary change occurs when there is no variation in reproductive success among individuals within a population. **True** ❒ **False** ❒

5. The only constraint to evolutionary change is lack of genetic variation. **True** ❒ **False** ❒

6. An evolutionary adaptation refers to an individual changing its physical, behavioural or other attribute in response to new environmental conditions. **True** ❒ **False** ❒

7. The rate of evolutionary change is influenced by the strength of selection. **True** ❒ **False** ❒

8. The rate of evolutionary change is influenced by the amount of genetic variation available in the population. **True** ❒ **False** ❒

9. Mutations arise in response to changes in the environment to enable populations to become adapted to new conditions. **True** ❒ **False** ❒

10. Evolution is about "the survival of the fittest" and survival, not reproduction, is what drives natural selection and evolution. **True** ❒ **False** ❒

11. Both mutations and sexual reproduction are sources of randomness in evolution.
True ❒ **False** ❒

12. Mutations are the only source of randomness in evolution. **True ❒ False ❒**

13. A heritable trait (for which there exists additive genetic variance) cannot be influenced by environmental conditions. **True ❒ False ❒**

14. Evolution is commonly referred to as the *theory* of evolution because it has not yet been proven scientifically. **True ❒ False ❒**

15. An evolutionary response to selection requires that the trait is heritable. Traits that are influenced by environmental conditions therefore do not respond to selection. **True ❒ False ❒**

16. All kinds of selection reduce the amount of genetic variation within a population. **True ❒False ❒**

17. Evolution happens because individuals change slowly over time. **True ❒ False ❒**

18. The most important processes affecting the maintenance of genetic variation are mutation and genetic drift. **True ❒ False ❒**

19. Evolution has involved a purposeful striving toward higher and more sophisticated life forms. **True ❒ False ❒**

20. Sometimes a given genotype can produce different phenotypes if exposed to different environmental conditions during growth and development. **True ❒ False ❒**

21. In species with sexual reproduction, the two sexes (males and females) are defined on the basis of differences in external morphology and anatomy. **True ❒ False ❒**

22. Evolutionary change is due to environmental forces that act on organisms to produce improvements. **True ❒ False ❒**

23. Compared to organisms with sexual reproduction, organisms with asexual reproduction are able to respond more rapidly to selection because they pass all of their genes (alleles) on to their offspring. **True ❒ False ❒**

24. Compared to organisms with asexual reproduction, organisms with sexual reproduction have a higher evolutionary potential and are more likely to adapt to changing environmental conditions. **True ❒ False ❒**

25. Humans evolved either from the gorilla or chimpanzee in Africa. **True ❒ False ❒**

26. Evolution occurs when the proportion of individuals possessing certain heritable traits and trait values changes between generations. **True ❒ False ❒**

27. The reason that the biological species concept is the most commonly used definition of a species is that it can be applied on all kinds of organisms. **True ❒ False ❒**

28. A phylogeny is a hypothesis about evolutionary relationships among different kinds of organisms. **True ❒ False ❒**

29. Evolutionary change occurs because it produces benefits to the organisms in the future. **True ❒ False ❒**

30. The oldest fossils known to date are about 850 million years old. **True ❒ False ❒**

31. Evolution is a theory about historical events, but because it does not generate predictions about the future it cannot be tested. **True ❒ False ❒**

Preconceptions revisited

At the very first day of this course you were asked to indicate whether a number of statements were correct or wrong to enable me to find out which (if any) pre- and misconceptions you had before the course commenced. Hopefully, you have now had a chance to examine the adequacy of your prior conceptions, argue about and test them during this course. To examine if I have succeeded in creating an interactive learning process and if you have changed you conceptions about evolutionary biology, I would like you to answer the same list of questions/statements again. Please indicate at the end of each statement if you think it is true or false by marking one of the boxes with an X.

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4. Random (or neutral) evolutionary change occurs when there is no variation in reproductive success among individuals within a population. **True** ❒ **False** ❒

5. The only constraint to evolutionary change is lack of genetic variation. **True** ❒ **False** ❒

6. An evolutionary adaptation refers to an individual changing its physical, behavioural or other attribute in response to new environmental conditions. **True** ❒ **False** ❒

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