

## Exercises II

### Basic concepts in microbial evolution and ecology

1. Ecosystems are spaces inhabited by organisms, who can make a living under the habitat conditions (ecosystem = habitat + organisms + living conditions)
2. The living conditions (environmental conditions) consist of physical, chemical and trophic state parameters
3. Environmental conditions in a habitat are being altered by the activity of living organisms.
4. Different ways of "how to make a living" emerge from
  - the energy conversion mechanisms employed
  - the presence or absence of reductants and oxidants
  - the conditions under which metabolic processes take place
  - the kind of material resources available for biosyntheses
  - abiotic compounds present in the habitat
  - interactions between organisms and between organism and environment
5. Interactions between organisms and the environment take place on the levels of space, time and the transfer of materials, information and energy.
6. The colonization of habitats as well as community composition and dynamics depend on
  - the stoichiometry of biomass formation and the presence and availability of the necessary chemical elements in the form of nutrients
  - the efficiency of the biochemical energy yield from dissimilation reactions and its coupling to biomass formation (growth)
  - the kinetics of growth
  - the environmental conditions which promote or hinder growth reactions
  - the plasticity of phenotypes of particular organisms and within populations
  - the presence and dominance of other organisms
7. The processes of living are coupled to each other and they form part of the earth's global physiology
8. Global geochemical cycles are mediated by the processes carried out by living organisms
9. Disturbances in the global mass and energy fluxes lead to alterations in environmental conditions and thus to changes in the kind of life processes.
10. Seven of the eight major chemical elements involved in life processes are cycled via redox reactions.
11. Biological mass fluxes are cyclic
12. Mass cycles are always coupled with energy fluxes
13. The functioning of energy fluxes is dictated by thermodynamic laws
14. Biological energy conversion takes place via electron transfer reactions
15. Metabolic diversity is a reflection of different electron flow paths employed by various organisms
16. The self-reproducing cell is the smallest unit which sustains life
17. Diversity and stability, but also plasticity of organisms is based on a universally valid genetic code
18. Evolution takes place through changes in genotypes and through repeated selection of phenotypic traits suitable to live under particular environmental conditions.
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