



AP[®] Biology
2004 Sample Student Responses
Form B

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4. Organisms differ from one another and yet share common characteristics.
- Select two kingdoms and briefly describe three characteristics used to distinguish between members of one kingdom and members of the other.
 - Describe three characteristics (at least one molecular and one cellular) that members of these two kingdoms share.
 - Propose an explanation for the existence of similarities and differences between the two kingdoms.

4) a) Kingdom Plantae and Kingdom Animalia both belong to Domain Eukarya yet have quite different characteristics. The members of Kingdom Plantae are photosynthetic, which means that they are autotrophs (they produce their own food from inorganic materials). The members of Kingdom Animalia, on the other hand, are heterotrophs. They can't produce organic materials from inorganic materials and have to consume them from their external environment. The members of Kingdom Plantae have photosynthetic pigments and/or organelles such as the chloroplast. The members of Kingdom Animalia don't have such pigments or chloroplasts. The organisms in Kingdom Plantae have cell walls surrounding their cells as well as cell membrane, but the cells of the organisms in Kingdom Animalia have only cell membrane surrounding them.

b) Both kingdoms' members are eukaryotic, which means that they have a distinct nucleus containing their hereditary material, DNA. The members

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of both kingdoms have cell membranes surrounding their cells. Members of both kingdoms share the structure of their ^{cell} membranes as their existence:

The cell membrane is composed of a phospholipid bilayer with proteins embedded in it. The process of translation and transcription are essentially similar between the members of two kingdoms. RNA

polymerase attaches itself to the DNA and adds nucleotides together, forming mRNA (messenger RNA).

The mRNA, after RNA splicing (removal of introns), moves out of the nucleus. It then attaches to a ribosome, with the ribosomal subunits moving close together. tRNA attaches to mRNA with codon-anticodon recognition, and has an amino acid attached to it.

As it moves along with mRNA, another tRNA arrives and attaches to mRNA. ~~It~~ also has an amino acid attached to it. The amino acids form a peptide bond with the other, and synthesis of proteins so continues.

c) There exists similarities between the two kingdoms because they have evolved from the same ancestor.

According to cell theory, all cells are formed from other cells, which means that there had to be a cell at the beginning in order for the organisms in the two kingdoms to be formed. Since heterotrophs evolved

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From autotrophs, the members of Kingdom Animalia evolved from autotrophs. The members of Kingdom Plantae are autotrophs, and they have evolved from previous autotrophs, so they share a common ancestor. Heterotrophs had to evolve after autotrophs since no O_2 was present in the early Earth atmosphere. What accounts for the differences between the two kingdoms is their ways of evolution. Both went through natural selection, and they faced different conditions, so ^{according to} the survival-of-the-fittest theory of Charles Darwin, the ones best suited to their environment survived, and since their environments were different, the well-adapted individuals were different. Thus they evolved into two different kingdoms.

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~~Plants and Animals~~

~~2 Kingdoms, Plants and Animals~~

The kingdom Plantae ^(Plants) and Animalia (Animals) can be distinguished by ~~three~~ ^{some} characteristics such as ~~the~~ the animals lack of chloroplasts, ~~and~~ vacuoles, and ~~plasmodesmata~~.

Animals lack the chloroplasts (Photosynthetic organelles of plants, consist of thylakoids containing chlorophyll, a pigment that absorb, blue and red light, and reflects green light). Animals also lack large, central vacuoles that plants have; these are like large "storage bubbles" ~~containing~~ containing water and nutrients. When a plant cell divides the membrane forms a cell inside the vacuole and then splits at the vacuole. Animal cells also lack plasmodesmata, ^{connections} ~~holes~~ in the membranes ~~and~~ ~~parts~~ of plants which allow them to pass things such as hormones to each other without ~~tearing~~ passing them through a membrane.

Plants and animals have ~~some~~ similarities as well; both use ATP (Adenosine Triphosphate) as their major energy transfer molecules; both are eukaryotic, ~~have~~ have a membrane-bound nucleus and organelles; and both have mitochondria, ~~for~~ ~~performing~~ ~~cellular~~ ~~respiration~~ membrane bound organelles for ~~used~~ ~~for~~ ~~performing~~ performing cellular respiration.

Though these similarities could have, theoretically,

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formed by convergent evolution, it's highly unlikely. These similarities probably formed because plants and animals ~~that are related~~ share a common ancestor, an organism of which the line that eventually evolved into animals and the ~~line that~~ line that eventually evolved into plants split off of. This explains why these ~~differences~~ similarities exist in almost every plant and animal cell; the differences came from the accumulation of changes (mutations) after their lines split from each other.



4. Organisms differ from one another and yet share common characteristics.

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- b) Describe three characteristics (at least one molecular and one cellular) that members of these two kingdoms share.
- c) Propose an explanation for the existence of similarities and differences between the two kingdoms.

The Plant kingdom and Animal kingdom ~~are~~ have differences and similarities. Plants are autotrophs and can make their own food by photosynthesis, converting light energy into energy stored in ATP. ~~At~~ Animals are heterotrophs ~~are~~ and consume ~~of~~ other organisms for food. Animals are able to move while plants are unable to move. ~~At~~ Animals need to move to hunt down their ~~prey~~ prey ~~of~~ for consumption, plants however do not need to move and rely on photosynthesis for food. Plants have an alternation of generation between diploid ~~and haploid~~ sporophyte and ~~of~~ haploid gametophyte as their dominant generation. Animals however are diploid as their dominant generation.

The two kingdoms share characteristics being eukaryotic, multicellular and reproduce by mitosis. Being ~~are~~ eukaryotic, both ~~are~~ have a true nucleus, a nuclear membrane and relatively bigger ribosomes compared to prokaryotes. They are both multicellular, consisting of many cells to form tissues, organs and/or systems. They also both reproduce by meiosis to increase genetic variability. Meiosis is a process which a diploid organism produces two gametes/spores and include, prophase 1, metaphase 1, anaphase 1, telophase 1, prophase 2, metaphase 2, anaphase 2 and telophase 2.



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An explanation for similarities and differences is evolution by isolation. Convergent evolution and genes from a similar ancestral parent lead to similarities. Behavioral, ecological, seasonal and geographic isolations are examples of mechanisms leading to differences. Mutations also play an important role in differences.

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