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Level: HL IB in Biology
Subject: Biology
Topic: IB HL Biology
Type: Mark Scheme

All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills

Answer 1

The correct answer is C because in order for speciation to occur a population must be split up by a range of different barriers (seasonal, behavioural or geographical). Over time each group will experience different selection pressures and ultimately become reproductively isolated from each other.

- **A is incorrect because for speciation to occur the barrier must be between individuals of the same species. Different species would already be reproductively isolated from each other**
- **B is incorrect since slight changes to the phenotype would probably not be enough to prevent these individuals from reproducing with members of the same species. Greater changes would be needed to isolate them reproductively**
- **D is incorrect as the ability to mate with one another means that those organisms belong to the same species**

Answer 2

The correct answer is A because the diagram represents geographical (allopatric) speciation. A geographical barrier separates two populations of the same species, with each population adapting to different environments. Over time the genetic differences between the populations accumulate to the point where they become reproductively isolated from each other.

- **B and D are incorrect as the initial barrier that separates the two populations is geographical and not temporal**
- **C is incorrect because the two populations are initially composed of individuals of the same species, not different species**

Answer 3

The correct answer is D because the organisms found in the newer rock layers show gradual changes that took place over many millions of years compared to those found in the older rock layers. The main differences are the size of the lower body and wings that changed over time.

- **A is incorrect because the changes would have occurred from 500 million years ago until 180 million years ago, not the other way around**
- **B and C are incorrect because none of these changes can be considered dramatic, the organisms still resemble each other, besides the increase in abdomen- and wing size**

Answer 4

The correct answer is B. Polyploidy increases allele diversity and having multiple copies of the same gene will reduce the chance of recessive mutations being expressed in the phenotype.

- **A is incorrect because polyploidy will not have an impact on the rate of meiosis or gamete formation**
- **C is incorrect since polyploid individuals will be unable to reproduce with diploid plants, thus it can lead to sympatric speciation**
- **D is incorrect because polyploidy will lead to more crossbred individuals in a population, not a higher occurrence of purebreds**

Answer 5

The correct answer is C because only changes in heritable characteristics are passed on to subsequent generations.

A implies that evolution has a purpose, where it is in fact the result of random mutation.

B and D do not refer to the heritable nature of the changes in the organisms' bodies or the advantageous characteristics, so there is no guarantee that these would lead to evolution. E.g. An organism having put on weight ahead of the winter is an advantageous characteristic, but it is not heritable, so will not lead to evolution.

Answer 6

The correct answer is B because a lack of gene exchange between two populations allows genetic differences to accumulate.

A, C and D are incorrect because they all contain incorrect statements I, III, or both.

- **Speciation can result from geographical separation by a mountain range or water, but these are not the only ways that gene exchange can be prevented.**
- **Differences in physical characteristics may develop between two separate populations, but only once they can no longer interbreed to produce fertile offspring will speciation have occurred.**

Answer 7

The correct answer is C because this set of fossils forms part of a growing fossil record. No one set of fossils alone can prove that evolution has occurred, but the more fossils there are, the stronger the evidence for evolution over time.

A is incorrect because while this set of fossils does contain several transitional fossils, it is not complete; fossilisation events are too rare for this to ever be the case.

B is incorrect because it implies that evolution has a purpose, where it is in fact the result of random mutation. In addition to this, the fossils in this image do not tell us anything about the environment in which the animals evolved.

D is an incorrect statement; neither limbs or fins are always advantageous, but rather it depends on the environment in which they are used.

Answer 8

The correct answer is A because this is an accurate description of the selective breeding process.

B involves allowing the plants to reproduce asexually and would just produce clones.

C describes the process of genetic modification.

D suggests that the process of selective breeding only takes two generations, while in reality it takes many generations for the desired characteristics to become widespread in the population of crop plants.

Answer 9

The correct answer is D; darkened wings from soot particles in the air may well help with escape from predators, but this is an example of an acquired characteristic and is therefore not heritable, so will not be passed to future generations.

The presence of a selection pressure is essential for natural selection to take place, because it means that some individuals will have an advantage over others; in this case predation, combined with darkened tree trunks from air pollution, acts as a selection pressure. The camouflaged moths have a survival advantage and therefore an increased chance of reproducing and passing on their melanistic alleles.

There must be variation in heritable characteristics (here given as genes) for natural selection to take place.