

1. Explain antibiotic resistance observed in bacteria in light of Darwinian selection theory.**Solution:**

As per Darwin's observation, the environment selects entities with favourable variations, and these entities are capable of surviving. When a population of bacteria is attacked by a specific antibiotic, sensitive bacteria tend to perish, while other bacteria possessing favourable mutations turn resistant even in the presence of antibiotics, and these survive, thriving, and rapidly multiplying as the other competing bacteria have died out. Thus, the number of bacteria is on the rise. In addition to this, they mass transfer these genes, which give them resistance to bacteria, to other bacteria. Consequently, bacteria resistant to antibiotics widely spread across, making the entire population become antibiotic-resistant.

2. Find out from newspapers and popular science articles any new fossil discoveries or controversies about evolution.**Solution:**

Fossil discovery of dinosaurs had some interesting revelations. It sheds light on the evolution of reptiles in the Jurassic era. This revelation gave rise to the discovery of the evolution of other animals, such as mammals and birds. Two unfamiliar fossils recently unearthed in China led to a controversy over the evolution of birds. One such genus of primitive birds were *Confuciusornis*. These were crow-sized and thrived during the Cretaceous era in China.

3. Attempt giving a clear definition of the term species.**Solution:**

Species is a group or population of individuals having the potential to interbreed and produce sustainable and fertile offspring.

4. Try to trace the various components of human evolution (hint: brain size and function, skeletal structure, dietary preference, etc.)**Solution:**

Human evolution can be based on different components, namely:

- Size of the brain
- Body posture
- Food habits/dietary preferences
- Characteristics/features

The following table depicts the same:

Human evolution stages	Size of the brain	Body posture	Food preferences	Features
Dryopithecus africans	—	Knuckle-walking, ape-like walk	Leaves and tender fruits	Equal-sized arms and legs, large canines
Ramapethicus	—	Semi-erect posture	Nuts and seeds	Large molars, small canines
Australopithecus africanus	450 cm ³	Completely erect posture, around 1.05m tall	Fruits (herbivorous)	Inhabited trees, stone weapons for hunting, incisors & canines are smaller
Homo habilis	735cm ³	Completely erect posture, around 1.5m tall	Carnivorous	Small canines, first to make tools
Homo erectus	800 cm ³ to 1100 cm ³	Completely erect posture, around 1.5m – 1.8m tall	Omnivorous	For hunting, used bone and stone tools
Homo neanderthalnsis	1300 cm ³ to 1600 cm ³	Completely erect posture, around 1.5m – 1.66m tall	Omnivorous	Inhabited caves, buried their deads, hid their bodies for protection
Homo sapiens fossils	1650 cm ³	Completely erect posture, 1.8m	Omnivorous	Possessed strong jaw with teeth closely placed, inhabited caves, and made carvings and paintings in caves. Developed a culture and were referred to as the first modern men

Homo sapiens sapiens	1200 cm ³ to 1600 cm ³	Completely erect posture, around 1.5m – 1.8m tall	Omnivorous	Possess a high intelligence quotient, referred to as the living modern man. Developed language, speech, culture, art, and language. Cultivation of crops and domestication of animals observed.
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5. Find out through the internet and popular science articles whether animals other than man have self-consciousness.

Solution:

Apart from humans, there are many other animals that possess self-consciousness. One such example is the Dolphin. They are believed to have a high level of intelligence. Also, they have a sense of self and can identify themselves amongst others. They whistle, tail-slap and exhibit body movements to communicate with each other. Some other animals that exhibit self-consciousness are parrots, crows, gorillas, orangutans, chimpanzees, etc.

6. List 10 modern-day animals and using the internet resources link it to a corresponding ancient fossil. Name both.

Solution:

The list is as follows:

Name of the animal	Name of the fossil
Horse	Eohippus
Man	Ramapithecus
Elephant	Moeritheres
Whale	Protocetus
Fish	Arandaspis
Giraffe	Palaeotragus

Dog	Leptocyon
Camel	Protylopus
Tetrapods	Ichthyospega
Bat	Archaeonycteris

7. Practise drawing various animals and plants.

Solution:

Take cues from seniors and teachers for names of different plants and animals. Go through different science books, magazines, and encyclopedias to get an idea of different plant and animal species. To get further details, the internet serves as the ultimate option. There is a huge range of plants and animals from which you can pick the easiest one to begin with and practice them. Try tracing the outline first and then fill in the details.

8. Describe one example of adaptive radiation.

Solution:

When members of a single assemblage or lineage deviate evolutionarily into a range of different forms, it is adaptive radiation. These are the forms that are governed by natural selection and the usage of resources or habitats. The Darwin's finches of the Galapagos islands had shared or common ancestors, whereas now, we have different sorts of modified beaks based on their food preferences. In order to suit their feeding habits, these finches have adopted different eating preferences and varied beak types. From a single seed-eating finch ancestor, different finch species with varied dietary habits have evolved, such as blood-sucking, insectivorous entities, etc.

9. Can we call human evolution as adaptive radiation?

Solution:

Human evolution can be referred to as adaptive radiation because adaptive radiation is an evolutionary process which gives rise to new species from a single common ancestor but in the case of human evolution, although we share a common ancestor, we humans have undergone an eventual but progressive alteration in the eating preferences, structure of body, etc. The evolution of humans does not include diversification and radiating into different species, which in fact, is a distinguishing feature of adaptive radiation.

10. Using various resources such as your school library or the internet and discussions with your teacher, trace the evolutionary stages of any one animal, say horse.

Solution:

During the Eocene era, the evolution of the horse began with Eohippus and involved the following evolutionary phases:

Eohippus → Mesohippus → Merychippus → Pliohippus → Equus

Evolutionary traits observed were as follows:

- Increase in the size of the body
- Elongated neck
- Expansion of the third digit
- Enhanced structural composition of the teeth to feed on grass
- Broadening of the limbs
- Eventual decrease in the lateral digits
- Strengthened back
- Sense organs and brain development

