

## EXERCISE

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

As per Darwin's observation, the environment selects entities with favorable variations, 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 favorable 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, resistant to bacteria, to other bacteria. Consequently, bacteria resistant to antibiotic widely spread across making the entire population to become antibiotic-resistant.

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

Fossil discover of dinosaurs had some interesting revelations. It conveys about the evolution of reptiles in the Jurassic era. This revelation gave rise to the discovery of evolution of other animals such as mammals and birds. Two unfamiliar fossils recently unearthed in China exploded 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 offsprings.

**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 <sup>3</sup>	Completely erect posture, around 1.05m tall	Fruits (herbivorous)	Inhabited trees, stone weapons for hunting, incisors & canines are smaller
Homo habilis	735cm <sup>3</sup>	Completely erect posture, around 1.5m tall	Carnivorous	Small canines, first to make tools
Homo erectus	800 cm <sup>3</sup> to 1100 cm <sup>3</sup>	Completely erect posture, around 1.5m – 1.8m tall	Omnivorous	For hunting used bone and stone tools
Homo neanderthalnsis	1300 cm <sup>3</sup> to 1600 cm <sup>3</sup>	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 <sup>3</sup>	Completely erect posture, 1.8m	Omnivorous	Possessed strong jaw with teeth closely placed, inhabited caves, made carvings and paintings in caves. Developed a culture and were referred to as the first modern men
Homo sapiens sapiens	1200 cm <sup>3</sup> to 1600 cm <sup>3</sup>	Completely erect posture, around 1.5m – 1.8m tall	Omnivorous	Possess high intelligence quotient, referred to as the living modern men, Developed language, speech, culture, art, language. Cultivation of crops and domestication of animals observed.

**5. Find out through internet and popular science articles whether animals other than man has 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 oneself amongst others. They whistle, tail-slap and exhibit body movements to communicate with each other. Some other animals that exhibit self-consciousness are parrot, crow, gorilla, orangutan, chimpanzee 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	Moerithers
Whale	Protocetus
Fish	Arandaspis
Giraffe	Palaeotragus
Dog	Leptocyon
Camel	Protylopus
Tetrapods	Icthyospega
Bat	Archaeonycteris

**7. Practise drawing various animals and plants.**

**Solution:**

Take cues from seniors, teachers for names of different plants and animals. Go through different science books, magazines, encyclopedia to get an idea of different plant and animal species. To get further more details, 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 up 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 the blood-sucking, insectivorous entities etc.

### 9. Can we call human evolution as adaptive radiation?

#### Solution:

No, human evolution can be referred to adaptive radiation as 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 human 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 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 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