Solution 1
Evolution.
Solution 2
Charles Robert Darwin.
Solution 3
False.
Solution 4
The presence of feathers on birds and dinosaurs shows that they are closely related to each other.
Solution 5
Planaria.
Solution 6
Wild Cabbage.
Solution 7
Sea water.
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Solution 8
Methane, Ammonia and Hydrogen Sulphide.
Solution 9
The Origin of Species.
Solution 10
Homologous Organs.
Solution 11
Dinosaurs and Archaeopteryx.
Solution 12
(a) Wings of bird and wings of bat.
(b) Wings of birds and wings of insects.
Solution 13
The human beings who look so different from each other in terms of size, color and looks are set to belong to the same species because they can inter breed to produce fertile offsprings.
Solution 14
Cabbage, Broccoli, Cauliflower, Kohlrabi and Kale.
Solution 15
Wild cabbage.
Solution 16
(a) Homologous: Analogous.
(b) Stages.
(c) Homo sapiens.
(d) Wild Cabbage.
(e) Darwin.
Solution 17
(i) - c.
(ii) - b.
(iii) - e.
(iv) - a.
(v) - d.
Solution 18
A trait of an organism which is 'not inherited' but develops in response to the environment is called an acquired trait. Example - If a beetle does not get sufficient food for a considerable time, its weight will be reduced due to starvation. The low weight of the beetle is an example of acquired trait. A trait of an organism which is caused by a change in its genes (DNA) is called an inherited trait. Example - The change of colour from red beetle to green beetle is

an example of inherited trait.
Solution 19
For a trait of an organism to be inherited, it should bring about a change in the genes present in the reproductive cells or gametes of that organism. The traits acquired during the life time of a person do not bring about a change in the genes present in its reproductive cells or gametes and hence they are not inherited by the offsprings.
Solution 20
The wings of a butterfly and the wings of a bat cannot be considered homologous because though the function of wings in both the cases is same but they have different basic design. The butterfly has a fold of membranes as wings which are associated with few muscles but has no bones whereas the wings of bat are supported by bones.
Solution 21
Forelimb of humans and forelimb of lizard are the homologous organs and the wing of insect and the wing of bird are analogous organs.
Solution 22
The remains of dead animals or plants that lived in the remote past are known as fossils. The fossils provide evidence of evolution. For example, a fossil bird called Archaeopteryx looks like a bird but it has many features which are found in reptiles. This is because Archaeopteryx has feathered wings like those of birds but teeth and tail like those of reptiles. Therefore, Archaeopteryx is a connecting link between the reptiles and birds and suggests that birds have evolved from reptiles. Thus, fossils provide evidence that the present plants and animals have originated from the previously existing ones through the process of continuous evolution.
Solution 23
The changes in DNA during reproduction are mainly responsible for evolution. The changes which take place in the DNA of species go on accumulating from one generation to the next. So, if the changes in the DNA of any two species are less, then the two species are quite close to one another in evolutionary terms. But if the changes in the DNA of two species are much more, then the two species will be far apart from one another in evolutionary terms. Thus, it is the characteristic of the extent of change in the DNA which is being used to determine how close two species are in evolutionary terms.
Solution 24
The presence of homologous organs in different animals provides evidence for evolution by telling us that they are derived from the same ancestor who had the 'basic design' of the organ on which all the homologous organs are based.
Solution 25
Sometimes a species may completely die out. It may become extinct. Once a species is extinct, its genes are lost forever, it cannot reemerge at all. The small numbers of surviving tigers are a cause of worry because if they all die out and become extinct, their genes will be lost forever. Our coming generations will not be able to see Tigers at all.
Solution 26
Geographical isolation cannot be a major factor in the speciation of an asexually reproducing organism because it does not require any other organism to carry out reproduction.
Solution 27
Human evolution has been studied by using the various tools of tracing evolutionary relationships like excavating (digging earth), carbon-dating, studying fossils and determining DNA sequences.
Solution 28
In evolutionary terms, we can say that bacteria has a 'better' body design than spiders, fish, and, chimpanzees. This is because though bacteria is one of the simplest and primitive life forms but it still inhabits and survives in some of the most inhospitable (most

unfavourable) habitats such as hot springs, deep-sea thermal vents and ice in Antarctica. Most other organisms (including spider, fish and chimpanzees) cannot survive in such harsh environments.
Solution 29
Some amount of variations are produced even during asexual reproduction but it is very small. The number of variations produced during sexual reproduction is, however, very large. It is due to these variations that no two human beings look alike. The number of successful variations is maximized by the process of sexual reproduction, so we can conclude that the variation is a necessity for organic evolution. Example: Animal reproduced by sexual reproduction show large number of variations.
Solution 30
(a) A species is a population of organisms consisting of similar individuals which can breed together and produce fertile offspring's. Plant species - Wheat, Paddy, Sunflower etc. Animal species - Cat, Dog, Tiger, etc.
(b) The important factors which could lead to the rise (or formation) of a new species are the following:
(i) Geographical isolation of a population caused by various types of barriers (such as mountain ranges, rivers and sea). The geographical isolation leads to reproductive isolation due to which there is no flow of genes between separated groups of population.
(ii) Genetic drift caused by drastic changes in the frequencies of particular genes by chance alone.
(iii) Variations caused in individuals due to natural selection.
Solution 31
The evidence was given by Stanley L. Miller and Harold C. Urey in 1953. They assembled an apparatus to create an early earth atmosphere which was supposed to consist of gases like ammonia, methane and hydrogen sulphide, but no oxygen) over water. This was maintained by them at a temperature just below 100^{O} C and electric sparks were passed through the mixture of gases to stimulate lightning. At the end of a week, they found that 15% of the carbon (from methane) had been converted to simple compounds of carbon including amino acids which make up protein molecules.
Solution 32
Geographical isolation is the major factor in the speciation of sexually reproducing animals because it interrupts the flow of genes between their isolated populations through the gametes.

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Solution 33
Bacteria have simpler body plan when compared with human beings. Both of them have evolved differently. Bacteria can inhabit most of the unfavourable habitats such as hot springs, deep- sea thermal vents and the ice in Antarctica.
Solution 34
(a) The theory of origin of life on earth was given by J.B.S Haldane. He suggested in 1929 that life must have developed from the simple inorganic molecules (such as methane, ammonia, hydrogen sulphide, etc.) which were present on the earth soon after it was formed. He said that the conditions on earth at that time (including frequent lightning) could have converted simple inorganic molecules into complex organic molecules which were necessary for life. These complex organic molecules must have joined together to form first primitive living organisms. Haldane also suggested from theoretical considerations that life (or living organisms) originated in the sea water.
(b) Those species which are now extinct are studied by studying their fossils which are found during the digging of earth.
Solution 35
Evolution is the sequence of gradual changes that takes place in the primitive organisms over millions of year in which new species are produced. Darwin's theory of evolution is known as 'The Theory

of Natural Selection'. It can be described as follows:
(i) Within any population there is natural variation. Some individuals have more favourable variations than others.
(ii) Even though all species produce a large number of offspring's, populations remain fairly constant naturally.
(iii) This is due to the struggle between members of the same species and different species for food, space and mate.
(iv) The struggle for survival within populations eliminates the unfit individuals. The fit individuals possessing favourable variations survive and reproduce. This is called natural selection.
(v) The individuals having favourable variations pass on these variations to their progeny from generation to generation.
(vi) These variations when accumulated over a long period of time, lead to the origin of a new species.
Solution 36
(a) Analogous Organs: Organs which performs similar function but are different in structure and origin. Example - wings of a bird and wings of an insect. Homologous Organ: Organs which have different functions but similar structure and origin. Example - fore arm of frog, lizard, bird and human.
(b) The presence of analogous organs indicates that even the organisms having organs with different structures can adapt to perform similar functions for their survival under hostile environmental conditions. Thus, the presence of analogous organs in different animals provide evidence for evolution by telling us that though they are not derived from common ancestors, they can still evolve to perform similar functions to survive, flourish and keep on evolving in the prevailing environment.
Solution 37
(a) The process by which new species develop from the existing species is known as speciation. New species are formed when the population of same species splits into two separate groups which then get isolated from each other geographically by the barriers such as mountain ranges, rivers or the sea. The geographical isolation of the two groups of population leads to their reproductive isolation due to which no genes are exchanged between them. However, breeding continues within the isolated populations producing more and more generations. Over the generations, the processes of genetic drift (random change in gene frequency), and natural selection operate in different ways in the two isolated groups of population and make them more and more different from each other. After thousands of years, the individuals of these isolated groups of population become so different that they will be incapable of reproducing with each other even if they happen to meet again. We then say that two new species have been formed.
(b) Geographical isolation will not be a major factor in the speciation of a self pollinating plant because it does not depend on other plants for its process of reproduction to be carried out.
Solution 38
(a) Natural selection is the process of evolution of a species whereby characteristics which help individual organisms to survive and reproduce are passed on to their offspring, and those characteristics which do not help are not passed on.
(b) Yes, only those variations that confer advantage to an individual organism will survive in a population. This will become clear from the following example. Suppose there is a population of red beetles in the green bushes and a colour variation arises during reproduction so that one beetle is now green in colour (instead of red). This variation offers advantage of survival because the green beetle can mix up with green bushes, it cannot be spotted and eaten up by a crow and hence its population will increase. If, however, the variation had produced a blue coloured beetle, then this colour could not offer any survival advantage because blue beetle in green bushes could be easily spotted by a crow and eaten by it.

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