22. Evolution of life

Exercises

1 A. Question

The phrase ‘hot dilute soup’, was used by

A. Oparin

B. Darwin

C. Haldane

D. Pasteur

Answer

The phrase ‘hot dilute soup’ was used by Haldane in context when he was referring to the formation of the complex compounds on the earth. According to him, during cooling of the earth, simple organic compounds combined with each other to give rise to complex compounds and this formation and collection of complex compounds in sea water had converted the sea water into a hot dilute soup.

On the other hand Oparin had not used such a phrase but had worked on how life was originated on earth, Pasteur never gave any such concept regarding formation of complex compounds and had told that life arises from pre-existing life, Darwin had gave the concept of natural selection and had never used the phrase ‘hot dilute soup’.

Therefore, correct option is (c) Haldane.

1 B. Question

Which gas was absent in the atmosphere at the time of origin of life?

A. ammonia

B. hydrogen

C. oxygen

D. Methane

Answer

Gases that were present at the time of origin of life are ammonia, hydrogen, nitrogen, carbon dioxide, methane, and water vapour. Oxygen was formed at a

very later stage. Therefore, the gas which was absent at the time of origin of the earth is oxygen.

Since, all gases except oxygen given in options are present at the time of origin of earth, correct option is (c) oxygen.

1 C. Question

The first organisms on primitive earth were

A. autotrophic

B. heterotrophic and anaerobic

C. parasitic

D. prokaryotic and autotrophic

Answer

On the primitive earth there was no molecular oxygen and an anaerobic environment existed there. So, it is believed that the organisms at that time had used organic compounds for their energy source and are therefore heterotrophic.

Since organisms had used direct organic compounds as their energy source and had not synthesized their own food, they were not autotrophic. Also, there were no other life forms on which they can reside as a parasite, they were also not parasitic.

Since there was no oxygen at that time and organisms had used organic compounds as their energy source, first organisms on earth were heterotrophic and anaerobic.

Therefore, the correct option is (b) heterotrophic and anaerobic.

1 D. Question

The greatest weakness in Darwin's theory was his failure to explain

A. over production

B. survival of the fittest

C. struggle for existence

D. variations

Answer

The greatest weakness in Darwin's theory was his failure to explain variations. He had explained variations but was not able to tell anything about their source or how variations arise in a species. He told that there are differences among species which help them to adapt to the environment in a

better way but he was not able to explain how these variations arise in species. He did not hold and any evidence for explaining this.

He had very nicely explained the concept of overproduction using examples that every species has the ability to produce a large number of animals but since due to large number of organisms and limited resources, there is a struggle of existence between members of same species. He also explained that only that organism survives who by competing to gete adaptd to the environment and is fit for their environment and therefore survives.

Since, Darwin was failed to explain the sources of variations, correct option is (d) variations.

2 A. Question

Fill in the blanks with suitable words :

Earth was a hot revolving ball of_____ about 4.6 billions of years ago.

Answer

Earth was a hot revolving ball of **gas** about 4.6 billions of years ago.

Explanation: Formation of earth had taken 4.6 billion of years ago and at that time no life form existed over here. It is a huge mass of gas with extreme temperature and dry climate. Due to these characteristics of the earlier earth, it is called that earth was a hot revolving ball of gas about 4.6 billions of years ago.

2 B. Question

Fill in the blanks with suitable words :

Lightest element hydrogen was found in the _____ layer of the earliest earth.

Answer

Lightest element hydrogen was found in the **outermost** layer of the earliest earth.

Explanation: During the day's earth was formed heavy elements were found at the center of the earth. Lighter elements like aluminum, silicon formed the earth crust and lightest elements like hydrogen, carbon, oxygen were found in the outermost layer of the earth.

2 C. Question

Fill in the blanks with suitable words :

Variations caused by sudden genetic changes are called _____.

Answer

Variations caused by sudden genetic changes are called **Mutations**.

Explanation: The concept of mutation was given by Hugo De Vries in 1902. According to him, variations are changes in the genetic constitution of same species arise due to sudden changes in the genetic makeup. He termed those variations caused by sudden genetic changes as mutations.

2 D. Question

Fill in the blanks with suitable words :

Darwin explained the survival of the fittest, but not their_____.

Answer

Darwin explained the survival of the fittest, but not their **arrival**.

Explanation: Darwin explained that variations (changes in the genetic makeup of an organism with time) are responsible for natural selection. Nature selects the fittest on the basis of variations which help the organism to survive and get adapt to the environment. But Darwin was unable to explain the source and how these variations had arisen. Therefore, it is said that Darwin explained the survival of the fittest, but not their arrival.

3. Question

Match the following :

A	B
1. Lamarck	a. Neo-Darwinism
2. Darwin	b. mutation theory
3. Hugo Devries	c. theory of natural selection
4. Oparin	d. theory of inheritance of acquired characters
	e. theory of chemical evolution

Answer

1. Lamarck- (d) theory of inheritance of acquired characters

Explanation- Lamarck had given the theory of inheritance of acquired characters. According to him depending on the use and misuse of the organ, new needs changes in the traits of the organism takes place. The organism acquires these traits according to the organ he is using most or using least. He thought these acquired traits are transferred to the next generation and depending on these concepts he had given the theory of inheritance of acquired characters.

2. Darwin- (c) Theory of natural selection

Explanation- Darwin had given the theory of natural selection. According to him nature selects and favors the survival of those organisms which have advantageous variations which help the organism to get adapt in the changing

environment and these advantageous variations are selected and are inherited by the next generation. Those variations which do not provide any survival advantage are not selected by nature.

3. Hugo De Vries- (b) Mutation theory

Explanation-Hugo De Vries was the one who had given the concept of mutation. He suggested that there are variations (changes in the genetic makeup of an organism) which are caused due to sudden changes in the genetic makeup. He termed the variations caused by sudden changes in genetic makeup as Mutation.

4. Oparin- (e) Theory of chemical evolution

Explanation- This theory was an answer to the question that how life originated on the earth and was given by both Oparin and Haldane independently. According to his theory initially on earth, there was no oxygen and life had arisen due to various chemical changes over here. He suggested that solar radiations, ultraviolet lights, and lightning had caused these chemical reactions due to which life was aroused.

4 A. Question

Answer the following:

What is organic evolution?

Answer

Initially on earth, there was no life form. But due to chemical reactions and evolution, some primitive cells were formed. These primitive cells like bacteria, algae, fungi, and protozoan are the one who had given birth to the complex life forms that we observe today.

These primitive cells had undergone various changes with time due to which they had given birth to complex life forms that we observe today. The process of these slow changes with time through which primitive cells had undergone to give rise to complex life forms is known as organic evolution.

Organic evolution was not a sudden process. It had taken years and generations whose heritable changes with time had gone on modifying and finally gave rise to such complex life forms.

4 B. Question

Answer the following:

Explain Lamarck's theory of use and disuse of organs with suitable examples.

Answer

Lamarck had given the theory of inheritance of acquired characters based on the new needs and use and disuse of organs. This theory is also known as Lamarckism.

Lamarck's theory was based on certain assumptions which are as follows:

● According to him, environment is continuously changing and in order to get adapt to the changing environment, each organism has some new needs because if the organism won't change with the environment there will be no survival.

● So, according to him in order to fulfill the new needs, the organism makes certain changes in the use of the organs. It happens that in order to fulfill the need they start using one organ at a very higher rate and avoids the use of some organ. From here the concept of use and disuse of organs was aroused.

● According to the concept of use and disuse of organ Lamarck concluded that the organ that we use more frequently becomes stronger and the one which is rarely used starts disappearing.

● Also, he thought that the characters that the organism acquires due to change in environment are inherited by the coming generations.

● For understanding the concept of Lamarck we can use Giraffe as an example.

According to Lamarck, the ancestors of the Giraffe were not as long as that we see today. They were small as grass; small plants were available to them as food. Later on, when there was no availability of food they started stretching trees using their neck and forelimbs. So, due to this change in environment and fulfilling his need giraffe has acquired the structure as we see today and due to this, he had such long neck and forelimbs.

Following picture depicts Lamarckism in giraffe:

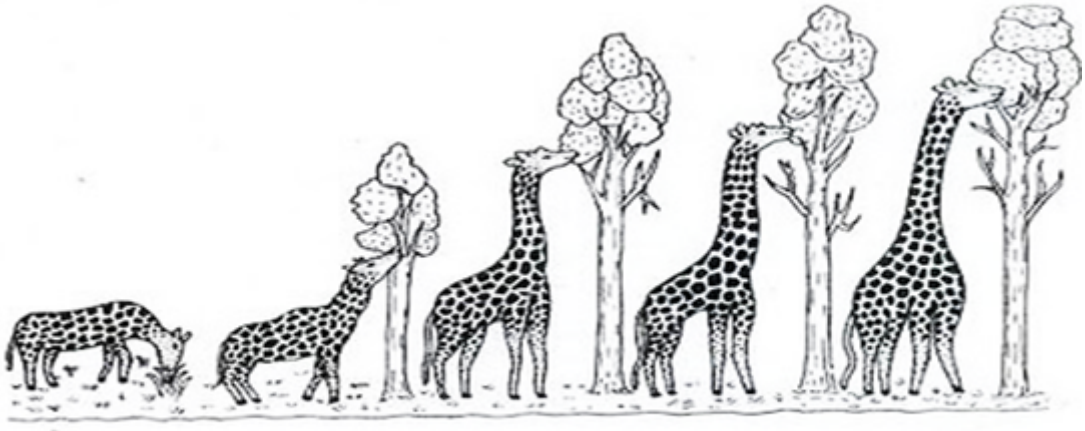

Diagram showing elongation of neck in giraffe according to Lamarck.

4 C. Question

Answer the following:

What is the role of variations in evolution?

Answer

Variations are the differences and changes that the next generation exhibits as compared to their parental generation.

Variations play a very important role in evolution. As we know the environment is continuously changing and in order to adapt to the changing environment organism also needs to make certain changes; otherwise they won't be able to survive.

Variations make this thing possible because they are the changes which arise spontaneously due to some reason or the other. These are the changes which can be both advantageous and harmful to the organism. The variations which are advantageous are selected by the environment because they provide benefit in the survival while those are harmful are rejected by the environment. As the advantageous variations are selected by the environment they help in the evolving the organism with the changing environment so it can better adapt to the environment. Also, these variations are inherited by the next generation so with time they start becoming part of that species and thus evolve the species with the change in environment.

4 D. Question

Answer the following:

What is a mutation?

Answer

The concept of mutation was given by Hugo De Vries in 1902. According to him, mutations are the variations or the changes which arise from the sudden change in genetic makeup of the organism. As these changes take place in genetic makeup they are further inherited by the future generations.

Mutations also form the basis of evolution as they help the organism to get evolve with the changing environment.

4 E. Question

Answer the following:

Define Neodarwinism.

Answer

Neodarwinism is a modern concept which is the combination of all the theories and concepts given by different scientist. Neodarwinism includes the theory of natural selection given by Darwin, Mutation theory is given by Hugo De Vries and different concepts of inheritance and heredity given by Mendel. All these theories combine to give a modern concept which is known as Neodarwinism.

4 F. Question

Answer the following:

Which organisms changed earth's atmosphere from reducing to oxidizing type?

Answer

Autotrophs are the organisms which aroused very late on the earth surface but their arrival on the earth surface is responsible for changing the environment of earth from reducing to oxidizing type. Blue-green algae were the first autotrophs that arrived on earth and release of molecular oxygen by them changed the environment from reducing to oxidizing type.

4 G. Question

Answer the following:

What were the limitations found in Darwinism and Lamarckism?

Answer

Darwin had given the concept of natural selection and variations and this theory is known as Darwinism. According to Darwinism environment is continuously changing and in order to survive each organism needs to adapt to the changing environment. But to adapt the environment-organism require certain changes in its previous form and Darwin termed this changes as a variation.

Darwin was very true in his concept that with the changing environment only those who will change and adapt the environment will fit best and survive in nature and these will happen due to certain genetic changes are known as variations.

But there was a certain limitation to this concept which is as follows:

● Darwin had given the concept of variations but he did not have any idea that how these variations arise in a population.

● He does not have any idea regarding the source of variations.

● He also not has any idea that how these variations are inherited or what is the mechanism of inheritance of variations.

Lamarck had given the theory of acquired characteristics which was based on the use and disuse of organism and this theory is known as Lamarckism. According to Lamarck environment is continuously changing and in order to get adapt to the changing environment, each organism has some new needs because if the organism won't change with the environment there will be no survival. So, according to him in order to fulfill the new needs, the organism makes certain changes in the use of the organs. It happens that in order to fulfill the need they start using one organ at a very higher rate and avoids the use of some organ due to which organ that we continuously use becomes stronger and the one which is rarely used becomes weaker and get extinct. From here the concept of use and disuse of organs was aroused.

But there were certain limitations associated with the Lamarckism which are as follows:

● Lamarck had told that acquired characteristics are inherited by the coming generations. But he was unable to tell that how acquired characters get associated with the reproductive cells.

● Lamarck was unable to explain how acquired characters can be inherited by the future generations.

● Acquired characters can't be inherited and Lamarck was wrong in his concept of inheritance of acquired characteristics.