Std.: 10 (English) **Science - II**

Chapter: 1

Q.1 **Textbook activity question.** **5**

1 Is each of the organs useful to organism?

Ans i. Most of the organs are useful to organisms. At the same time few organs may be present now but they have lost their function in the process of evolution.
ii. In human beings, appendix, tail-bone (coccyx), wisdom teeth and body hair are not useful now.

2 Which are the different organs in body of organisms?

Ans i. In digestive system - (Mouth, Stomach,Liver, Pancreas, intestine, etc.)
ii. Skeletal system - (Bones)
iii. Circulatory system - (Heart, Arteries, Veins , etc.)
iv. Respiratory system - (Diaphragm, Lungs, Larynx, etc) are some of the organs in an organism.

3 Are our wisdom teeth really useful for chewing the food?

Ans No, we do not use our wisdom teeth for chewing the food, because it is a vestigial structure in human body.

4 What do we call to the process of transfer of physical and mental characters from parents to the progeny?

Ans The process of transfer of physical and mental characters from parents to the progeny is called inheritance or heredity.

5 Which component of the cellular nucleus of living organisms carries hereditary characters?

Ans The chromosomes carrying hereditary characters called genes are located in the nucleus of a living cell.

Q.2 **Multiple Choice Questions** **7**

1 The causality behind the sudden changes was understood due to ..... theory of Hugo de Vries.

a. Mutation b. Translocation of DNA
c. Formation of RNA d. Translational process of DNA

Ans Option a.

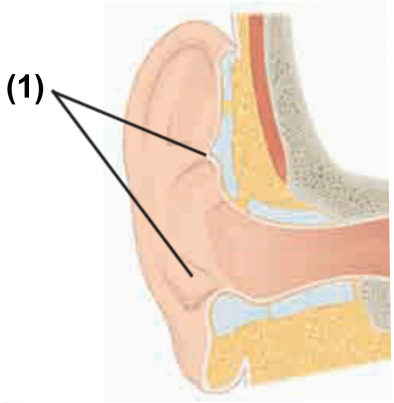
2 Information about protein synthesis is stored in:
(a) mRNA (b) tRNA (c) rRNA (d) DNA

Ans Option (d)

3 Transfer of information from molecule of DNA to RNA is called as ..... process.
a. Mutation b. Translocation c. Transcription d. Gradual development

Ans Option c.

4



The part in the above figure which is a vestigial organ is called as-
a. Appendix b. Coccyx c. Ear muscles d. Ear Pinna

Ans Option c.

5 Vestigial organ ..... present in human body is proof of evolution.
a. Gradual development b. Appendix c. Gene d. Ribosome

Ans Option b.

6 Evolution means ..... .

a. Classification of animals b. Speciation of animals
c. Gradual development d. Development of fossils

Ans Option c.

7 The proof for the fact that protein synthesis occurs through ..... was given by George Beadle and Edward Tatum.
a. Gene b. Ribosome c. RNA d. Transcription

Ans Option a.

Q.3 Give scientific reasons **4**

1 Many species of animals and birds are getting extinct.

Ans i. Animals and birds extinction may be caused by natural occurrences such as climatic heating or cooling or changes in sea levels.
ii. Habitat destruction as farming land expands and forests are cut-down. This is the main cause along with pollution and over fishing or hunting.

2 Huge animals like dinosaur become extinct.

Ans Inspite of the fact that the cause for dinosaur extinction is still a mystery, following events could have played a role.

i. Gas seeping and ash evolving from volcanoes suffocated most of the dinosaurs.
ii. The entire population of dinosaur may have been wiped out due to diseases.
iii. The dinosaurs could not survive after a big meteorite crashed into earth, drastically changing the climatic conditions.
iv. Imbalances in food chain leads to starvationof the dinosaurs.

Q.4 Laws / Define / Principles **2**

1 Define heredity.

Ans **Heredity** : Heredity is the process by which the biological characters from parental generation are transmitted to the next generation through genes.

Q.5 Write Short Notes on **10**

1 Lamarckism.

Ans 1. Lamarck proposed that morphological changes occurring in living organisms are responsible for evolution and the reason behind those morphological changes is activeness or laziness in that organism.
2. For example, neck of the giraffe has become too long due to browsing on leaves of tall plants by extending

their neck for several generations.
3. He called this concept as principle of use or disuse of organs.
4. He proposed that living organisms can transfer the characters which they have acquired during their lifetime to the next generation. This is called theory of inheritance of acquired characters.

2 Evolution.

Ans 1. Evolution is the gradual change occurring in living organisms over a long duration.
2. This is a very slow process through which development of organisms is achieved.
3. All the stages in changes which occurred in various components, ranging from stars and planets in space to the biosphere present on Earth, are included in evolution.
4. Formation of new species due to changes in specific characters of several generations of living organisms as a response to natural selection is called evolution.

3 Connecting link

Ans 1. Some plants and animals show some morphological characters by which they can be related to two different groups; hence they are called connecting links.
2. Connecting links prove that organisms have evolved.
3. For example – In Peripatus, characters like segmented body, thin cuticle, and parapodia-like organs are present. Similarly, these animals show tracheal respiration and open circulatory system similar to arthopods. Hence, this indicates that Peripatus is a connecting link between Annelida and Arthropoda.
4. Lungfish performs respiration with lungs (like amphibians) but it is a fish. These examples indicate that mammals have evolved from reptiles, and amphibians from fish.

4 Darwin's theory of natural selection.

Ans i. Darwin is famous for the theory which he published in the book titled 'Origin of Species'.
ii. Darwin's theory of natural selection is based on the concept of survival of the fittest.
iii. Organisms can reproduce prolifically.
iv. Under limited resources, organisms compete with each other in a life-threatening manner for their survival.
v. According to this theory, only those organisms survive which show modifications for winning the competition. The selected organisms then give rise to new species with their specific set of characters.

5 Embryology.

Ans 1. Study of the development of embryos is called embryology.
2. Comparative study of embryonic developmental stages of various vertebrates shows that all embryos show extreme similarities during initial stages and those similarities decrease gradually.
3. Embryos of fish, salamander, tortoise, chicken, pig, cow, rabbit, and man look similar in initial stages.
4. Embryology is used as one of the evidences of evolution as similarity in initial stages of development indicates common origin of all the animals.

Q.6 **Give explanation using the given statements.** **6**

1 Read the following statements and justify the same in your own words with suitable examples.
Geographical isolation of organisms gradually leads to speciation.

Ans i. It is the population of organisms that are separated by geographical factors like rivers changing their course, drifting of continent etc. and hence not able to exchange genetic material with other organisms of the same species.
ii. Example: A mountain range prevents two types of goat from mating, causing the gene pool to become less varied.
iii. Example: A forest fire causes permanent separation of a group of deer from their native population causing the small group to interbreed only with one another. Over the time the group becomes an entirely different species.

2 Read the following statements and justify the same in your own words with suitable examples.
Human evolution began about seven crore years ago.

Ans 1. The biodiversity that is seen is said to have been formed from very simple unicellular organisms. This gradual change is called evolution.
2. Last dinosaurs disappeared approximately 7 crore years ago.
3. At that time monkey-like animals are said to have evolved from some ancestors who were more or less

similar to the modern lemurs.
4. The tail of these monkey-like animals disappeared 4 crore years ago.
5. Ape-like animals evolved from these monkey-like animals, and the subsequent development of the brain and erect posture led to intelligent humanlike animals.
6. Various stages of hominid species ultimately evolved into the Homo sapiens.
Hence, we can say that human evolution began approximately 7 crore years ago

Q.7 Explain with the help of examples **12**

1 Read the following statements and justify the same in your own words with the help of suitable examples.
Human evolution began approximately 7 crore years ago.

Ans 1. The Earth's ice age began approximately 7 crore years ago. Under these conditions, dinosaurs went extinct. Mammal evolution and variety began during this period. Because of climate change, forest cover has reduced rapidly.
2. The ancestors of monkey-like animals were Lemur like animals that developed around this time. 3. Around 4 crore years ago, these monkey-like creatures gradually lost their tails.
4. The body and brain expanded, creating the first ape-like mammals. Monkey-like ancestors shared evolutionary connections with apes and human-like creatures.
5. Human evolution was characterised by changes in brain volume, upright walking abilities, and improved hand manipulation.
6. Human evolution began approximately 7 crore years ago. The true smart intelligent man evolved approximately 50,000 years ago.

2 Explain with suitable examples the importance of anatomical evidences in evolution.

Ans (1) The study of the internal structure of organisms is called anatomy.
(2) Anatomical similarities help as an evidence in the theory of evolution.
(3) When we see a human hand, forelegs of ox, patagium of bat, or flipper of a whale, there doesn't seem to be any similarity.
(4) Similarly, the use of each of these structure in different animals is different e.g. a human hand is used to pick up things, forelegs of ox are used to walk, bat's patagium is used to fly, and flippers of whales are used to swim.
(5) However, there is similarity in the structure of bones and bone-joints in the above-mentioned organs of each of these animals.
(6) This similarity indicates that these animals may have a common ancestor. Thus, anatomical evidence helps in understanding the evolution process.

3 Read the following statements and justify the same in your own words with the help of suitable examples.
Study of fossils is an important aspect of study of evolution.

Ans Fossils are the remains of organisms that once existed on Earth. They represent the ancestors of plants and animals, which are alive even today. Fossils provide evidences of evolution by revealing the characteristics of the past organisms, and the changes that have occurred in these organisms to give rise to a present organism. Fossils have the same shape as that of the original animal, but their colour and texture may vary widely. The colour of a fossil depends upon the type of minerals that form it. For example, the fossil of a bone will not have some constituents of the bone in it. It has the same shape as the bone, but it is chemically more like a rock.
Importance of Fossils:
(i) They inform us about the types of living things that existed in the past.
(ii) They inform us about the extent to which living things have changed over time.
(iii) The most recent fossil is found in a rock nearest to earth's surface. Therefore, they inform us about the time when a particular life form existed.

4 Read the following statements and justify the same in your own words with the help of suitable examples.
There is evidences of fatal science among chordates.

Ans i. Very young embryos of fish, amphibians, reptiles, birds and mammals show quite similar structure in the early stages.
ii. As the further growth takes place, they acquire different patterns
iii. The initial similarity between the vertebrate embryos is an evidence that during evolution, there was a common ancestor for all the vertebrate classes.

iv. This is called embryological evidence for vertebrate evolution.

Q.8 **Complete the sentences in paragraph** **3**

1 **Complete the statements by choosing the correct options from the brackets.**

(gene, mutation, translocation, transcription, gradual development, appendix)

i. The causality behind the sudden changes was understood due to _____ principle of Hugo de Vries.

ii. The proof for the fact that protein synthesis occurs through _____ was given by George Beadle and Edward Tatum.

iii. Transfer of information from molecule of DNA to RNA is called _____ process.

iv. Evolution means _____.

v. The vestigial organ, _____ present in human body is a proof of evolution.

Ans i. mutation, ii. gene, iii. transcription, iv. gradual development, v. appendix

Q.9 **Write laws, theories and explain.** **6**

1 Explain Lamarck's theory of 'acquired characters'.

Ans i. Jean-Baptiste Lamarck proposed that morphological changes occurring in living organisms are responsible for evolution and he called this concept as principle of 'use or disuse of organs'.

ii. From the diagram, he tried to explain that the neck of giraffe has become too long due to browsing on leaves of tall plants by extending their neck for several generations.

iii. Similarly, he gave other examples as wings of birds like ostrich and emu have become weak due to no use, legs of the birds like swan and duck have become useful for swimming due to living in water.

iv. Another example of Lamarckism was given regarding snake's legs that they have lost their legs by modifications in their body for burrowing habit.

v. All these examples are types of 'acquired characters' and are transferred from one to another generation.

vi. This is called as theory of inheritance of acquired characters or Lamarckism.

2 Explain the theory of evolution and mention the proof supporting it.

Ans 1. According to the theory of evolution, the first living material (protoplasm) appeared in the ocean.

2. Over a period of time, it developed into a unicellular form of life.

3. Some gradual and orderly changes took place in the unicellular forms, and multicellular forms of life came into existence.

4. As time passed, these multicellular life-forms became more and more complex.

5. All these changes were slow and gradual. This evolution took a long period of time, i.e. about 300 crore years.

6. These changes in living things took place at the cellular level, organ level, systemic level, and behavioural level, which led to the evolution of complex forms of life and a variety of life-forms.

7. This is known as the evolution of life on earth, or organic evolution.

8. The progressive development of plants and animals from their ancestors having different structural and functional organization is called evolution.

The proofs supporting the theory are:

- Morphological evidence
- Anatomical evidence
- Vestigial organs
- Paleontological evidence
- Connecting links
- Embryological evidence

Q.10 **Answer the following** **15**

1 Define heredity. Explain the mechanism of hereditary changes.

Ans Heredity is defined as the transfer of biological characters from one generation to another via genes.
Hereditary changes can occur due to the following changes:
1. Natural Selection- One allele is fixed for the population as it provides a survival advantage.
2. Genetic Drift- Sudden change in a small population due to which genetic variability is reduced.
3. Mutations- Sudden and inheritable changes in the genetic material that gives rise to a new allele.
4. Recombination- When the crossing over occurs during meiosis, the sequence of alleles changes on the chromosomes.

2 Which are the components the DNA molecule?

Ans i. The double helical structure of DNA was proposed by Watson and Crick.
ii. It is arranged in a double helix pattern and resembles the structure of a ladder.
iii. DNA molecule consists of three types of chemical components, such as phosphate, sugar (deoxyribose) and four nitrogenous bases (guanine, cytosine, thiamine and adenine).
iv. All deoxy ribose molecules are linked to each other by phosphate linkage.
v. Phosphate group are negatively charged and it gives DNA molecule a negative charge.

3 What is the function of the appendix of our digestive system?

Ans i. The appendix is a vestigial organ that was once used by our herbivorous ancestors.
ii. It was found that in herbivorous vertebrates the appendex is comparatively larger and it helped in the digestion of tough herbivorus food such as the bark of a tree.
iii. It is also supposed to be a store house of good bacteria.

4 Explain the meaning of genetic disorders and give names of some disorders.

Ans a. Diseases or disorders occurring due to tabnormalities in chromosomes and mutations in genes are called genetic disorders.
b. Genetic disorders may ccur due to increaseor decrease in chromosome number and deletion or translocation of any part of chromosomes.
c. some expamples of geetic disorders are as follows:
i. Polygenic disorders like diabetes, blood pressure, heart disorder, cleft lip, cleft palate, spina bifida, asthama, obesity etc
ii. Monogenic disorders like TAy Sach's galactosemia, albinism, sickle-cell anemia, haemophilia,night blindness, phenylketonuria, cytic fibrosis, etc.
iii. Chromosomal disorders like Down's syndrome, etc.

5 (a) Define vestigial organs.
(b) Write names of some vestigial organs in human body.
(c) Write name of those animals in which these vestigial organs are functional.

Ans (a) Vestigial organs are degenerate organs that are inadequately developed and non-functional. They could be useful in certain related and unrelated species, as well as in ancestors.
(b) Names of vestigial organs in human body-Appendix, tail-bone or coccyx, wisdom teeth and body hair.
(c) It is useful in monkeys and other animals like rabbits, cows, horses, etc. for movement of the ear pinna.

Q.11 Answer the following in detail **40**

1 Explain the formation of complex proteins.

Ans i. Proteins are synthesised by DNA using RNA, known as central dogma. mRNA is produced as per the sequence of nucleotides on DNA, using one of the strands of DNA and this is called transcription.
ii. The mRNA formed in nucleus comes out in cytoplasm bringing the coded message from DNA for amino acids.
iii. The code for each amino acid consists of three nucleotides called triplet codon each mRNA has thousands of triplet codons.
iv. The amino acids brought in by tRNA,are bonded together by peptide bonds with the help of rRNA.
v. During this process, ribosomes keeps on moving from one end of mRNA to the other end by the distance of one triplet codon which is called translocation.
vi. Such many chains come together to form complex proteins.

2 Genetic variation is responsible for formation of new species from earlier one or how are the hereditary changes responsible for evolution ?

Ans i. Living organisms can produce new individuals like themselves due to genes only and some of those genes are transmitted to the next generation without any changes.
ii. Due to this, some of the characters of parents are transmitted to their offspring.
iii. Formation of new species of plants and animals is the effect of evolution. Species is the group of organisms that can produce fertile individuals through natural reproduction.
iv. Variation of one organism from another creates the change in habitat, living conditions and the food on which the organism survives.
v. Sometimes genetic modification i.e. Mutation is responsible for creation of varied characteristics and may cause generation of new species.
vi. Hence, Genetic variation is responsible for formation of new species from earlier one which is independent of the geographical factors.

3 Write evolutionary history of modern man.

Ans 1. The last dinosaurs disappeared approximately 7 crore years ago. At that time, monkey-like animals are said to have evolved from some ancestors who were more or less similar to the modern lemurs.
2. The tail of these animals disappeared about 4 crore years ago. These animals then developed due to enlargement of their brain. Their hands were also improved and thus ape-like animals evolved.
3. Ape-like animals which lived in South and North East Asia evolved into gibbon and orangutan. Around 2.5 crore years ago, ape-like animals from Africa evolved into gorilla and chimpanzee.
4. Evolution of some of the 2-crore-year-old species of apes occurred in a different way. They started living on land as forests started to decline due to dry environment. Their lumbar bones developed in such a way that they started standing in an erect posture; hence, their hands became available for use, anytime.
5. The first record of human-like animals is in the form of Ramapithecus ape from East Africa. This ape grew in size and intelligence.
6. About 20 lakh years ago, the skilled human developed. About 15 lakh years ago, human walking with an erect posture was evolved.
7. The brain continued to evolve. Neanderthal man can be considered as the first example of wiseman. The Cro-Magnon man evolved about 50 thousand years ago and afterwards, this evolution had been faster than the earlier.
8. About 10 thousand years ago, wise-man started to practice agriculture. He started rearing cattle herds, established cities, and cultural development took place. The art of writing was invented about 5,000 years ago. About 400 years ago, modern science emerged, and industrial society emerged about 200 years ago.

4 Write evolutionary history of modern man.

Ans a. The family to which human beings belong is called Hominidae. It was in the Miocene age that the family Hominidae split from the Pongidae(apes) family. Dryopethicus was the first in the evolution of man in the stages of evolution and some believe him to be the common ancestor of man and apes.
b. Around 2.5 million years later, the Ardipithecus ramidus, which could both live on trees, as well as walk about on land, roamed the earth. Further evolution took place over the next 1.5 million years, which brought forth the
Australopithecus afarensis.
c. Another half million years later, came the Homo Habilis, the Homo Erectus and the Homo Heidelbergensis.

The modern man or Homo Sapiens are thought to have evolved about 2 - 3 million years ago in Africa. The evolutionary history of modern man is as follows:

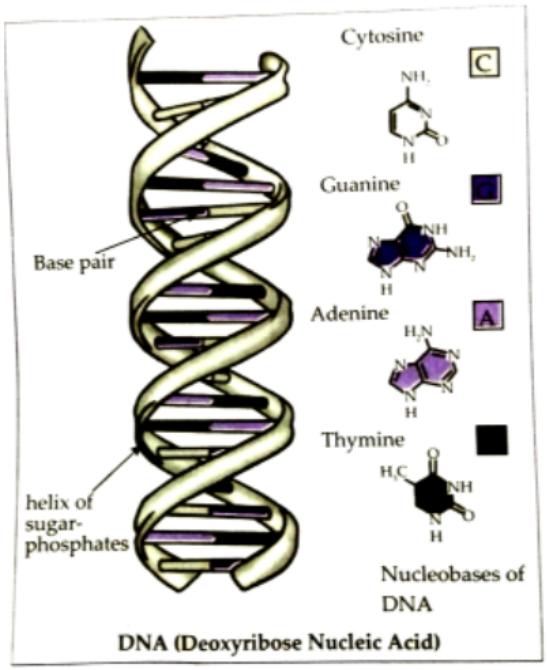
Year	Evolution
15 million years ago	Dryopithecus (ape-like) and Ramapithecus (man-like)
3 – 4 million years ago	Man-like primates
2 million years ago	Australopithecines, also called Homo habilis,lived in East Africa
1.5 million years ago	Homo erectus
1,000 – 40, 000 years ago	Neanderthal man
75, 000 – 10, 000 years ago	Homo sapiens

5 Define fossil. Explain importance of fossils as proof of evolution.

Ans Large number of organisms get buried due to disasters like flood, earthquake, volcano, etc. Remnants and impressions of such organisms remain preserved underground. These are called fossils.
Importance of fossils as proof of evolution are as follows.
i. Carbon consumption of animals and plants stops after death and only the decaying processes of C-14 take place continuously.
ii. The ratio of C-14 to C-12 changes constantly with time as C-12 is non-radioactive in dead plants and animals.
iii. The time passed since the death of a plant or animal can be calculated by carbon dating i.e. by measuring the radioactivity of C-14 and the ratio of C-14 to C-12 present in the remains of the dead organism.
iv. The oldest fossils are buried deep in the Earth's crust, while the younger ones occupy the upper surfaces. Hence, fossils of invertebrates are found buried deep as they are very old and belong to the Palaeozoic era. The fossils of Pisces, Amphibians, and Reptiles were obtained in consecutive layers. The Mesozoic era was dominated by reptiles, while the Cenozoic era showed the presence of mammals and birds.
v. Thus, the study of fossils is an important aspect of evolution since it can be used in paleontology and anthropology for determining the age of the fossils and deducing information about their ancestors.

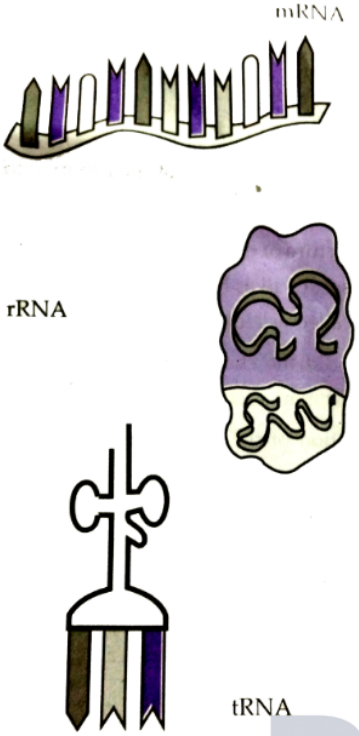
6 Sketch and explain the structure of DNA and various types of RNA.

Ans



i. DNA is made up of nucleotide molecules. Phosphate group, a sugar group and a nitrogen base are present in each nucleotide.
ii. The nitrogen base is of four types. Cytosine (c) guanine (G), thymine (T), and adenine (A).

iii. The order in which there nitrogen bases are present determines the genetic code.
iv. Human DNA has around 3 billion bases and most of the bases are the same in all human beings.
v. The order of nitrogen, bases forms genes which instructs cell how to prepare proteins.
vi. Nucleotides are joined together to form two long strands that twist to create a structure called a double helix.
vii. Adenine pairs with thymine and guanine pairs with cytosine.
viii. DNA is coiled tightlyl to form chromosomes which are found inside the nucleus.



i. Types of RNA are mRNA, rRNA and tRNA.
ii. Ribonucleic acid (RNA) is a nucleotide polymer, which is made of ribose sugar, a phosphate and bases as adenine, guanine, cytosine and uracil.
iii. The ribose sugar of RNA has a hydroxyl group and it is absent in DNA. RNA has a structure similar to DNA.
iv. rNA: It is a component of the ribosomes organelle and helps in protein synthesis.
v. mRNA: it carries information of protein synthesis from genes to the ribosomes.
vi. tRNA: It carries amino acids up to the ribosomes.

7 Explain the theory of evolution and mention the proof supporting it.

Ans There are various theories of evolution but the most acceptable one is the theory of 'Gradual development of living organisms'. According to this theory, the first living material which is the protoplasm was formed in the ocean. Gradual changes resulted in the formation of unicellular organisms and further developments resulted in the formation of larger and complex organisms. However, these changes did not occur overnight, they were slow and gradual changes which took almost 300 crore years. These changes and development are often referred to as evolution and are the prime cause of diversity of plants and organisms which we see on Earth today. There are various evidences which support evolution:

1. **Morphological evidence** - Similarity in morphological features of animals and plants is evidence that they have evolved from common ancestors. For example: In animals similarities like structure of mouth, position of eyes, structure of nostrils and in plants, similarities in characters like leaf shape, leaf venation, leaf petiole represent common ancestry.

2. **Anatomical evidence**: Organs of different animals are dissimilar in function but similar in structures of bones and bony joints shows that these animals may have common ancestors. For example: human hand, cat's foreleg, patagium of bat and flipper of whale perform different function but their bones are similar in structure.

3. **Vestigial organs as evidence**: Underdeveloped useless organs in organisms are called as vestigial organs. Such organs are useless in some organisms but these organs are useful in other organisms. For example: appendix useless in humans but functional in cattle. Ear pinna muscle useless in human but useful in monkeys.

4. **Connecting links** - Connecting links refers to plants and organisms which show characteristics related to

two different groups. For example, Peripatus is considered a connecting link between annelida and arthropoda. It has characteristics like segmented body, thin cuticle, and parapodia-like organs which are similar to annelids. It also show tracheal respiration and open circulatory system which is similar to arthropods. Another example is duck billed platypus which is a connecting link between reptiles and mammals because it lays eggs like reptiles and has mammary glands like mammals.

5. **Embryological evidence** - Embryology is used as one of the evidences of evolution. Comparative study of embryos shows that there is a lot of similarity in them at the initial stages whereas this similarity decreases gradually. This similarity in the development of embryos represents common origin of organisms.

8 Explain the process of formation of complex proteins along with its diagram.

Ans

(1) Information about protein synthesis is stored in DNA. The synthesis of appropriate proteins as per requirement is necessary for the body.

(2) These proteins are synthesized by DNA through RNA.

(3) The mRNA formed in the nucleus comes in the cytoplasm. It brings in a coded message from the DNA. The message contains codes for amino acids.

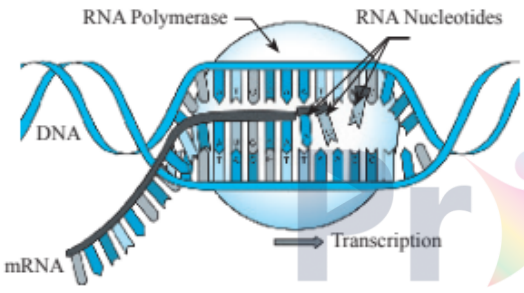
(4) the code for each amino acid consists of three nucleotides. It is called triplet codon.

(5) As per the message on mRNA, amino acids are supplied by tRNA. For this purpose, tRNA has anticodon. This is called translation.

(6) The amino-acids brought in by tRNA are bonded together by peptide bonds with the help of rRNA.

(7) During this process, the ribosome keeps on moving from one end of the mRNA to the other. This is called tranlocation.

(8) Many such chains come together to form complex.



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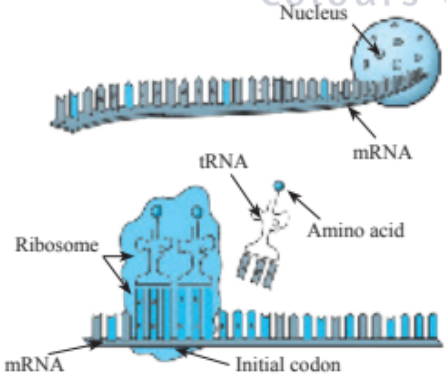

Translation and Translocation