Chapter 7
Evolution

1 Marks Questions

1.Name one fish like reptile that evolved from land reptile about 200 million years ago?
Ans. Ichthyosaurs.

2. For a long time, it was believed that life originated from decaying matter. What is this theory known as? Name the scientist who experimentally disproved this theory.
Ans. Theory of Spontaneous generation; Louis Pasteur.

3. If abiotic origin of life is in progress on a planet other than earth, what should be the conditions there?
Ans. Very high temperature, volcanic storms, Reducing atmosphere containing CH_4, NH_3, H_2 and water vapours.

4. Name the person who proposed that population tends to increase geometrically while food production increases arithmetically.
Ans. Thomas Malthus

5. Name the scientist who had also come to similar conclusion as that of Darwin about natural selection as a mechanism of evolution. Which place did he visit to come to conclusions?
Ans. Alfred Wallace, Malay Archipelago

6.Name any two vestigial organs found in human body?
Ans. Vermiform appendix, wisdom teeth.

7.What is the cause of speciation according to Hugo De Vries?
Ans. Mutations.

8.Name the phenomenon by which rapid speciation takes place?
Ans. Genetic Drift.

9.Name the two scientists who set up a special experiment to prove Oparin's theory of origin of life?
Ans. Urey & Miller.

10.Name the common ancestor of apes & man?
Ans. Dryopithecus.

11.Which period is known as "Age of amphibians"?
Ans. Carboniferous period.

12.What provided energy for a biotic synthesis on primitive earth?
Ans. Very high temperature due to lightening or uv – rays provided energy for a biotic synthesis.

13.Who showed that life comes from pre-existing life?
Ans. Louis Pasteur

14.What is meant by Gene pool?
Ans. Gene pool refers to sum total of different kinds of genes pooled by all the members of a population.

15.Which period is called "Age of Reptiles".
Ans. Jurassic period.

16.Name the species of human beings which is most closely related to modern man.
Ans. Cro - magnon.

17.What is "Founder's effect"?
Ans. Sometime a change in allele frequency is so different in new sample of population that they become a new species in such cases original drifted population becomes founder & this effect is called Founder's effect.

2 Marks Questions

1. Explain Oparin-Haldane theory of chemical evolution of life.
Ans. The first life form could have come from the pre-existing, non-living organic molecules (like RNA, Proteins, etc.) and the formation of life was preceded by chemical evolution.

2. Distinguish between convergent and divergent evolution giving one example of each.
Ans. Divergent Evolution – Development of different functional structures from a common ancestral form is called divergent evolution.
Homologous organs show divergent evolution.
Examples: Darwin's Finches, Australian Marsupials, locomotion in mammals.
Convergent Evolution – Development of similar adaptive functional structures in unrelated groups of organisms is called convergent evolution.
Analogous organs show convergent evolution.
Examples: Australian Marsupials and Placental mammals, various aquatic vertebrate and wings of insect, bird and bat.

3. What is adaptive radiation? Explain with an example.
Ans. Adaptive radiation is an evolutionary process that produces new species from a single, rapidly diversifying lineage. This process occurs due to natural selection. An example of adaptive radiation is Darwin finches, found in Galapagos Island. A large variety of finches is present in Galapagos Island that arose from a single species, which reached this land accidentally. As a result, many new species have evolved, diverged, and adapted to occupy new habitats. These finches have developed different eating habits and different types of beaks to suit their feeding habits. The insectivorous, blood sucking, and other species of finches with varied dietary habits have evolved from a single seed eating finch ancestor.

4. How did Louis Pasteur disprove spontaneous generation theory?
Ans. Louis Pasteur showed that in pre-sterilized flasks, life did not come from killed yeast while in another flask open to air, new organisms arose from 'killed yeast.

5.Define homologous organs? Give one example of organ homologous to hand of man?
Ans. Homologous organs are those organs which are similar in basic structure & embryonic developments but perform different functions. e.g. bones of forelimbs of whales, bat, birds and human beings.

6.What is the role of variation in evolution?
Ans. Variations are useful for survival of species in changed environmental situations. If a population of reproducing organisms are suited to a particular niche & if the niche is drastically altered the population could be wiped out however if some variations were to be present in few individuals, there would be some chances for them to survive.

7.Describe one evidence which decisively proves that birds have evolved from reptiles?
Ans. Missing link between birds & reptiles called. Archaeopteryx showed that "Birds have evolved from reptiles". These are organisms which show the characters of both birds (e.g. presence of wings & feathers in the body) as well as of reptiles (e.g. gong tail & jaws with identical teeth).

8.What is the study of fossils called? Mention any three points how the fossils throw light on past life?
Ans. Study of fossils is known as paleontology .
→ Cross-section of the earth's crust indicates the arrangement of sediments one over the other during the long history of Earth.
→ Different sediments contain different life forms which probably died during the formation of particular sediment.
→ Connecting or missing link – which contains characters of different groups.

9.Why has natural selection not eliminated sickle – cell anaemia?
Ans. Sickle cell anaemia is not eliminated during natural selection because in some cases, sickle cell anaemia is beneficial as it provides natural defense against malarial parasite.

10.Life originated from the earth's inorganic atmosphere in the past, but this no longer happens today. Give two reasons?
Ans. Life cannot be originated in the present day atmosphere because:-

(i)The temperature of present day atmosphere is much less than that of primitive atmosphere.
(ii)The present day atmosphere is oxidizing & not reducing due to presence of oxygen.

11.If you discovered a fossil bird with scales on the body & teeth in the beak. What would you conclude about its position in the animal kingdom?
Ans. Since this fossil bird has both avian characters & reptilian characters e.g. scales on body & teeth in beak it would be considered as a connecting link between reptiles & bird.

12.What is speciation? List any two events that lead to speciation?
Ans. Speciation refers to the origin of new species or the phenomena of development of new species from pre-existing one.
The two factors which lead to speciation are – Genetic drift, mutation & natural selection.

13.Would you consider wings of butterfly & a bat as homologous or Analogous & why?
Ans. Wings of butterfly & bat are said to be analogous because they have originated from different parts – e.g. in butterfly wings are originated from skin and feather & in bats wings are originated from forelimbs but both of them performs the same function of flying.

14.Define natural selection? Who else along with Charles Darwin proposed it as the mechanism of evolution?
Ans. Natural selection is a process of selection lay nature in which individuals with those characteristics which enable them to survive better in natural conditions would outnumber the others who are less adapted under the same natural conditions Alfred Wallace also proposed the same mechanism of evolution & called it “survival of fittest”.

15.A chimpanzee can hold objects by its hand & an elephant by trunk. Are these organs Analogous or homologous?
Ans. These organs are analogous organs as they are performing the same function of holding objects but are originated from different parts eg forelimbs in chimpanzee & nose in elephants.

16.Differentiate between convergent & divergent evolution?
Ans.

Divergent Evolution	Convergent Evolution
1. Evolutionary process of different species which produces new species diverged from a single ancestral form 2. e.g. Australian marsupials	1. When more than one adaptive radiation occurs in an isolated geographical area. 2. e.g. Camels are found in Asia &Llammas are found in south America.

17.Bring out differences between De Vrie's mutations Darwinian Variations?
Ans. (i) Mutations are large heritable changes in the characteristics of a population that arise suddenly. & cause speciation in single step while evolution for Darwin is gradual & occurs due to variations over number of generations.
(ii) Mutation are random & directionless while variations are small & directional.

3 Marks Questions
1. (i) State the Hardy-Weinberg principle.
(ii) When there is a disturbance in the Hardy-Weinberg equilibrium, what would it result in?
(iii) According to this principle, what is the sum total of all allelic frequencies?
Ans. (i) The allele frequency in a population are stable and constant from generation to generation.
(ii) Evolution.
(iii) One.

7. Figures given below are of Darwin' s finches?

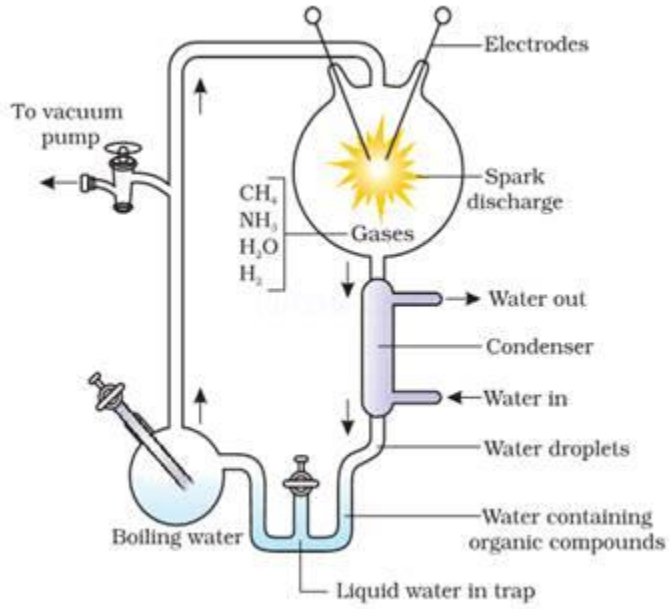
Variety of beaks of Darwin's finches.
(a) Mention the specific geographical area where these were found.
(b) Name and explain the phenomenon that has resulted in the evolution of such diverse species in the region.
(c) How did Darwin visit the particular geographical area?

Ans. (a) Galapagos Island.
(b) Adaptive radiation – The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation.
(c) Through sea voyage in a sail ship called H.M.S. Beagle.

8. Give examples to show evolution by anthropogenic action.
Ans. Excess use of herbicides pesticides etc. has resulted in selection oresistent varieties in a much lesser time scale. Same is true for antibiotic or drug resistant microbes.

9.By taking industrial melanism as on example, explain the concept of natural selection by evolution?
Ans. Theory of natural selection states that due to survival of fittest, the species change readily owing to preservation & transmission of minute variation & gradually give rise to new forms.
Example – In collection of moths in 1850 it was observed that there were whiter winged moth than dark winged but after industrialization there were darker wringed moth. This is due to the reason that During post industrial period trees trunk become dark due to industrial smoke under this condition, white winged moth do not survive due to predators dark winged moth survived Before industrialization sets in, thick growth off white colored lichen covered trees in that background white winged moth survived but dark – colored moth were picked out by predators hence nature selects which species is suitable.

10.Who were the two scientists that conducted an experiment to synthesise organic molecule abiotically? How did they provide the probable condition of the primitive earth in this experiment?



Ans. Urey & miller tried to create in the laboratory the similar conditions which might have existed in early primitive atmosphere. A mixture of water vapours methane, ammonia & hydrogen is exposed to electric discharge in a closed chamber, this fluid thus formed is allowed to stand for several week as a result, amino acids e.g. glycerine& alanine are formed from fluid. They suggested that electric discharge produced during lightening in primitive atmosphere of earth might have resulted in formation of organic compound.

11.What is Biogenetic law? How does comparative embryology provides evidences for evolution?

Ans. It has become evident from embryological studies that there was one developmental pattern.

In all organisms life begins with a unicellular structure. The embryo of fish, frog, turtle, bird & man resembles one another so closely that it becomes difficult to distinguish them. Mammalian embryo parses through fish – like, amphibian-like, reptiles like & bird like stages during development of an organism (ontogeny), some of the evolutionary steps (phylogeny) are repeated in different group of organism. This leads Ernst Haeckal to formulate famous theory – "RECAPITULATION THEORY / BIOGENETIC LAW.Which states that "Ontogeny recapitulates phylogeny" The sequence of embryonic development shows striking similarity e.g. appearance of gill cleft and notochord in embryonic development of all vertebrates from fish to man.

12.Chemical insectides remain useful only for a limited time. Explain with reference to evolution with a suitable example.

Ans. "Chemical insectides remain useful only for a limited time" because of the phenomena of natural selection with the course of time when chemical insecticides are excessively used to kill insects, some of the resistant varieties of the organism would have been created which are not killed lay the insect icicle such resistant varieties of the

unseats are selected lay nature & they multiply after sometime population of this resistant variety increases & the chemical insecticide would lee ineffective to control these insects for example DDT is a common insecticide for mosquitoes lout is now ineffective because DDT – resistant mosquitoes have appeared & selected in nature.

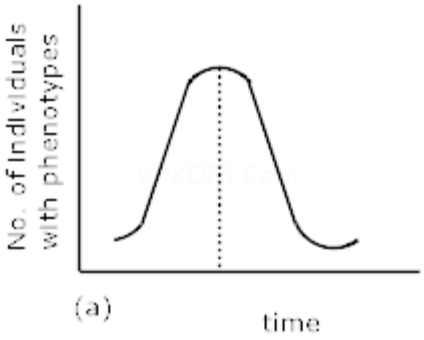
13.What are the facts that support Darwin's theory of Natural selection?
Ans. The following facts that supports Darwin's theory of Natural selection

1. Overproduction: – All organisms tend to multiply at high rate but it is not possible for all organisms to survive.
2. Struggle for Existence: – Because of limitation of space & food all the offspring of the result of overproduction will not survive & they will compete with one another to grow this develops struggle for existence not only among individuals of different species but also among same species.
3. Variations :- No two individuals of same species are exactly alike even coming out from same parent al stock.
4. Survival of fittest :- The individuals with useful variation will survive during struggle of existence while those with less fortunate variation would perish.

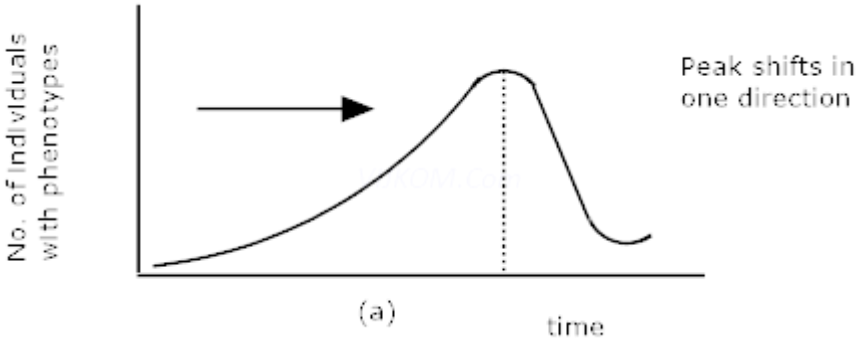
14.Trace the important events or stages of human development?
Ans. The common ancestor of apes & man is a primate Dryopithecus that lived about 15 million years ago the human evolution is as follows :-

1. Australopithecus :- They are 4ft, with brain capacity – 500 to 650 cc. They have bipedal locomotion, omnivorous &has erect posture. They hunted with stone weapon & lived in caves.
2. Homo Erectus :- They showed increase in brain size They are good hunters, ate meat domesticate animal & discover fire.
3. Netherlands man :- They were short with heavy brows retreating forehead large jaws & stooped postures They wore clothes, good hunters & tool makers.
4. Cromagnon man :- They were completely erect & 6ft tall. He used bones as tools & was a cave dweller. They are excellent tool makers & fine artists.
5. Homo sapiens :- They have brain capacity 1450cc. & skull much thicker. His intelligence has enabled him to adapt & control environment. He started agriculture.

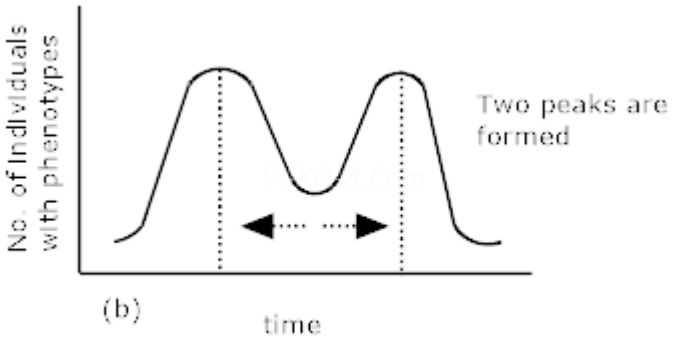
15.What are the three different ways in which selection may occur.
Ans. The three different ways in which selection may occur are as below:-
(i) Stablising Selection :- Individuals with intermediate value of heritable phenotypic characteristics are favoured over other individuals.



(ii) Directional Selection :- Individuals with one extreme of heritable phenotypic characteristic have an advantage over individuals in a population.



(iii) Disruptive Selection :- individuals with either of both extreme of heritable phenotypic characteristics have advantage over individuals with intermediate phenotype.



16.State in what ways Stanley miller simulated the condition of :-
i) Primitive atmosphere on earth.
ii) Energy source at the time of origin of life .
iii) Formation of organic molecule of life.
Ans. i) A fluid containing mixture of methane, ammonia, hydrogen & water vapour in a closed flask.
ii) Energy source during origin of life was sun. This energy in the experiment is provided lay electricdischarge using electrode.
iii) Organic molecules formed during experiment are amino acids.

17.What is Biogeography? How Darwin's finches provide biogeographical evidence in favour of evolution.

Ans. The branch of geography which deals with the study of pattern of distribution of plants &animals in different parts of earth is called Biogeography.

Example Galapagos islands – group of 14 islands in Pacific Ocean on west coast of South America. Charles Darwin during his voyage found that animals of these is lands resembles with those of South American is lands. E.g. birds of Galapagos Island called Darwin's finches do not resemble birds of South America so he concluded that finches were derived from ancestral stock that had emigrated from mainland to island & has undergone profound changes under environmental conditions.

18. How did louis pasteur successfully demolish the popular theory of spontaneous generation?

Ans. Louis Pasteur used a special swam-necked flask for his experiment. He took mixture of sugar &yeast powder & filled about half of it with water in this flask. He then boiled the content of flask till a steady current of steam rushed out from s-shaped tube – causing death of all microorganisms. After this flask remains unchanged. But when neck of flask was cut-off showed thick growth of microorganisms this is presumed that are contains microorganisms which in first case could not reach the flask whereas in second case they comes in direct contact with solution.

5 Marks Questions

1. What does Hardy weinberg's principle states? What are the factors which affects Hardy weinberg's equilibrium?

Ans. Acc. to Hardy Weinberg's principle, allele frequency in a population are stable & is constant from generation to generation i.e. total gene pool remains constant. This is called Genetic equilibrium e.g. In a diploid organism, suppose 'p' represents frequency of allele 'A' & 'q' represents frequency of allele 'q' .then frequency of AA = p2

" " Aa =pq

" " aa = q2

total alleles in F1 Generation

AA + 2Aa + aa = 1

P2 + 2pq + q2 = 1

(p + q) 2 = 1

Factors affecting Hardy – Weinberg Equilibrium :-

(i)Gene flow :- when migration of a section of a population to another place occurs, gene frequency changes in original as well as in new population.

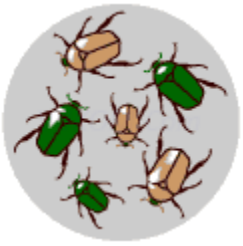
(ii)Genetic Drift :- If just by virtue of a chance or accident a particular allele frequency decrease or increase in a population.

(iii)Mutations:- which are sudden changes in the genotype which are carried over generation.

(iv)Genetic Recombination:- Sometimes changes in allele frequency is so different in new sample of population that they become a new species.
(v)Natural Selection:- process by which individual with particular heritable characteristics survive & reproduces at higher rate than other individuals favored by natural selection tend to be more common in next generation than in parent generation.

2. How do Darwin and Hugo de Vries after regarding Mechanism of Evolution?
Ans. Darwin : Darwinian variations are gradual, small and directional Hugo de Vries : put forth idea of mutations, mutations are sudden random and directional

3. With the help of suitable diagram, represent the operation of natural selection on different traits.
Ans. Natural selection is one of the basic mechanisms of evolution, along with mutation, migration, and genetic drift.
Darwin's grand idea of evolution by natural selection is relatively simple but often misunderstood. To find out how it works, imagine a population of beetles:
1. There is variation in traits.



For example, some beetles are green and some are brown.
2. There is differential reproduction.

Since the environment can't support unlimited population growth, not all individuals get to reproduce to their full potential. In this example, green beetles tend to get eaten by birds and survive to reproduce less often than brown beetles do.
3. There is heredity.

The surviving brown beetles have brown baby beetles because this trait has a genetic basis.

4. End result:

The more advantageous trait, brown coloration, which allows the beetle to have more offspring, becomes more common in the population. If this process continues, eventually, all individuals in the population will be brown.
If you have variation, differential reproduction, and heredity, you will have evolution by natural selection as an outcome. It is as simple as that.

4.What does Oparin – haldane hypothesis about origin of life suggests.
Ans. According to Oparin& Haldane's Biochemical origin of life; origin of life occurs in three stages

5.What is Chemogeny?
Ans. CHEMOGENY / CHEMICAL EVOLUTION :-Acc to them most of the primitive form of life would have generated spontaneously from some inorganic matter as a result of action of special external forces e.g. electric charge, uv-light etc.

1. Many saturated & unsaturated hydrocarbons were feasted when temp cooled to 900 c or below.
2. From hydrocarbons small chain compounds of C, H, O are formed which condense to form sugar.
3. Ketones & aldehydes condenses & polymerises to form fatty acid.
4. Ammonia, hydrocarbon & H2 O reacted together to form amino acid.
5. Hot sea water which was rich in primary organic compound reacted to form nucleotides.

6. What is biogeny?
Ans. BIOGENY / BIOLOGICAL EVOLUTION :- This stage consists of
i)Formation of nucleic acids by polymerization of nucleotide.
ii)Giant molecules of nucleoproteins have a tendency to be aggregated in various combinations to form large colloidal particles called COACERVATES.
iii)The development of plasma membrane resulted in accumulation of different substances inside coacervates& occurrence of certain internal reaction lad to development of cell.

7. What is Cognogeny?

Ans. Cognogeny :-Cognogeny involves differentiation or diversification of living beings from simplest first living cell. The first organism evolved was chemo- autotrophic bacteria which later converted to tree autotrophic bacteria e.g. green algae.