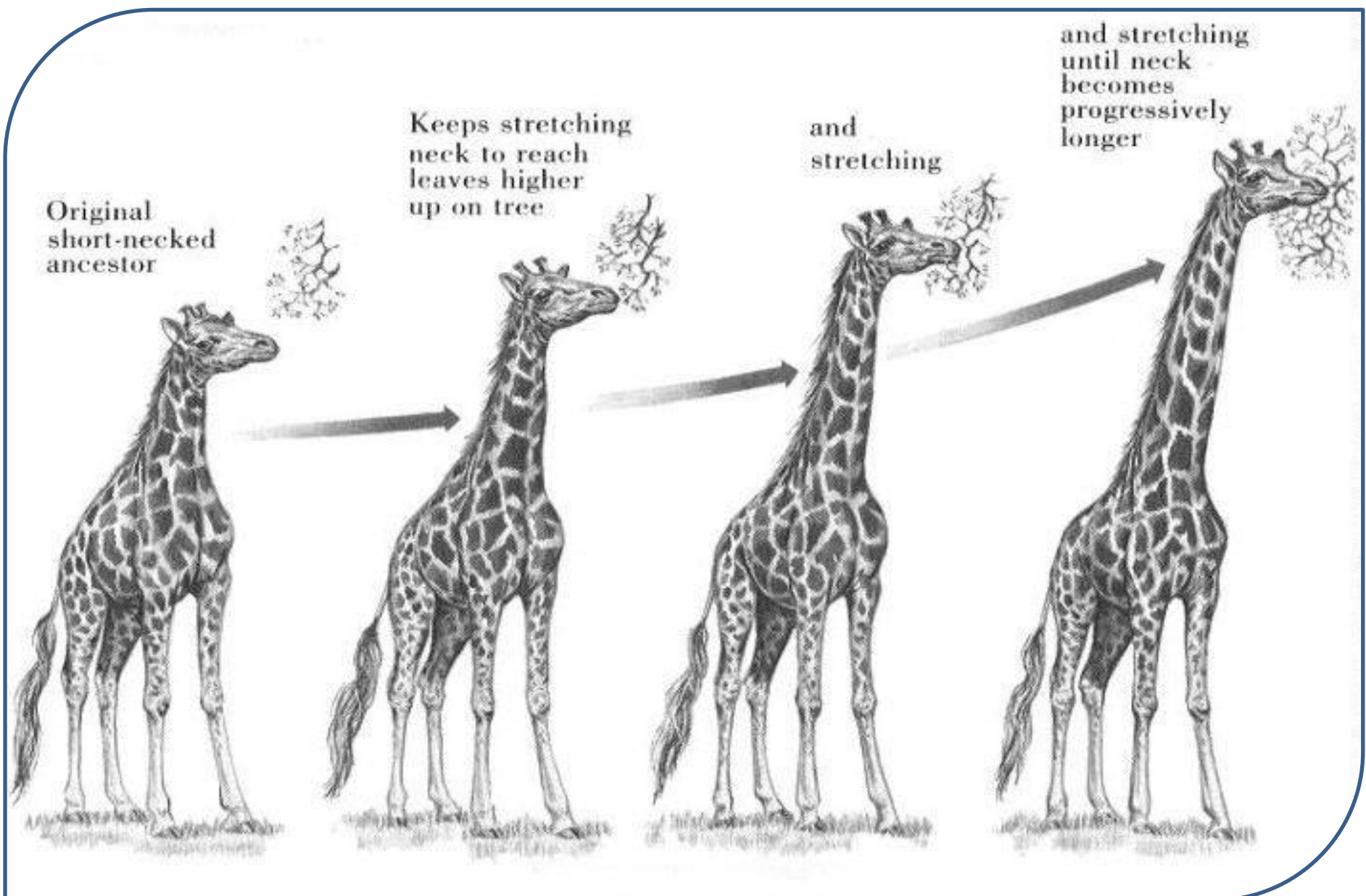




CHAPTER 24

Evolution



- **Exercise Short Answers**
- **Important Short Answers**
- **Exercise MCQ's**
- **Additional Important MCQ's**
- **Past MDCAT MCQ's**

Exercise Short Answers

Q:1 What are hydrothermal vents?

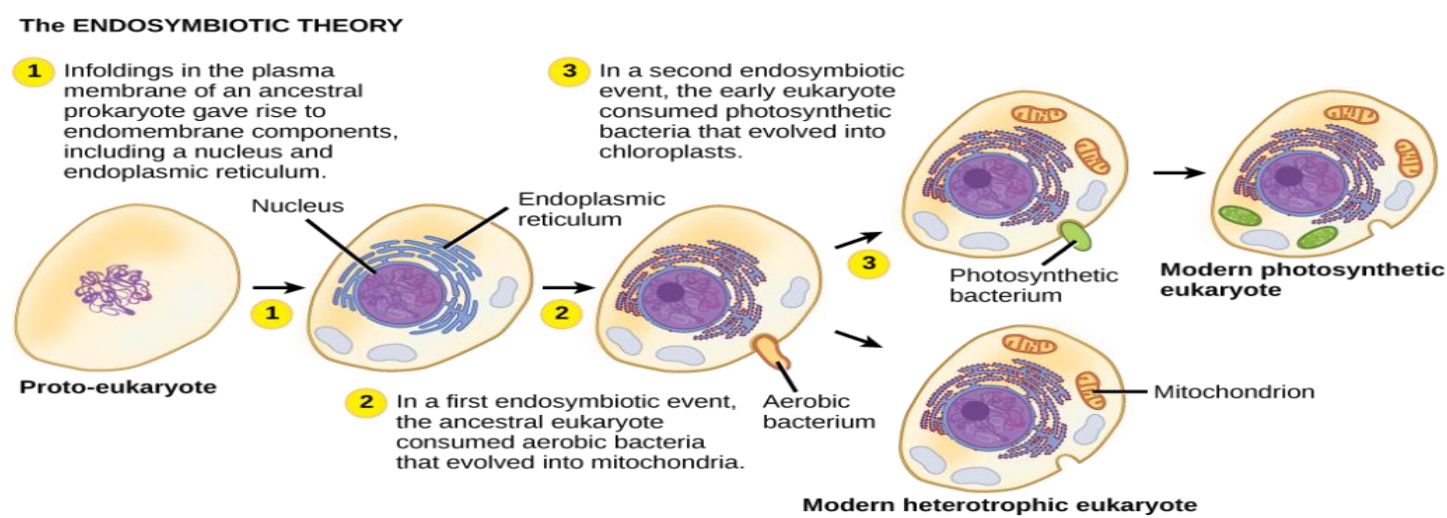
Ans: Hydrothermal vents: These are underwater hot springs, deep in the oceans and are considered to be related with the origin of life on earth.

- These vents could have supplied the energy and raw materials for the origin and survival of early life form.
- A group of bacteria, called archaeobacteria, that tolerate temperature up to 120°C and seem to have undergone less evolutionary change than any other living species support this vent hypothesis.

Q:2 State endosymbiont hypothesis.

Ans: Endosymbiont hypothesis: The eukaryotic cell might have evolved when a large anaerobic (living without oxygen) amoeboid prokaryote ingested small aerobic (living with oxygen) bacteria and stabilized them instead of digesting them. This idea is known as endosymbiont hypothesis.

- This idea was proposed by Lynn Margulis.
- According to this hypothesis, the aerobic bacteria develop into mitochondria which are site aerobic respiration and most energy conversion in eukaryotic cells. The possession of these mitochondria like endosymbiont brought the advantage of aerobic respiration to the host.
- The flagella have arisen through the ingestion of spirochetes.
- Ingestion of spirochete like prokaryotes like cyanobacteria would have been developed into chloroplasts in plants.



Q:3 Define population genetics.

Ans: Population genetic: The total aggregate of genes in a population at anyone time is called population gene pool and such study is called population genetics.

OR

Population genetics is the study of genetic variation within populations, and involves the examination and modeling of changes in the frequencies of genes and alleles in populations over space and time.

Q:4 How does fossil record provide evidence of evolution?

Ans: Fossils: The fossils are either actual remains or traces of organisms or impressions made by the body parts of organisms that lived in ancient times.

Fossil record as evidence of evolution:

- The succession of fossil forms is strong evidence in favors of evolution. It provides a visual record in a complete series showing the evolution of an organism.
- Evidence from biochemistry, biology and cell biology places prokaryotes as ancestors of all life and predicts that bacteria should precede all eukaryotic life in fossil record. Indeed the oldest known fossils are prokaryotes.
- Another evidence is the chronological appearance of different classes of vertebrate animals in fossil record. Fossil record shows that fishes were the first vertebrates to appear in the world, the amphibians next, then the reptiles come and then birds and mammals exist. This sequence is consistent with the history of vertebrate decent. The evolution of horse provides an example of such history.

Q:5 Explain the term homology with a suitable example.

Ans: Homology: The similarity in characteristics resulting from common ancestry is known as homology.

Example: For example fore limbs of man, bat horse and whale etc. are result of homology.

Q:6 What are vestigial organs? Give two examples.

Ans: Vestigial organs: Vestigial organs are historical remnants of structures that had important functions in ancestors but no longer essential presently and are supposed to be functional in remote past.

OR

The oldest homologues structures are vestigial organs, rudimentary structures that had important functions in ancestors are not important now.

Examples:

The examples of vestigial organs are vermiform appendix in carnivores, ear muscles in man.

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Q:7 How are evolutionary relationship reflected in DNA and proteins.

Ans: Evolutionary relationship among species is reflected in their DNA and protein-in their genes and gene products. If two species have gene and proteins with sequence of monomers that match closely the sequence must have been copied from a common ancestor. A common genetic code brings evidence that all life is related with each other. Thus molecular biology gives the evidence of evolution as the basis of unity and diversity.

Q:8 State Hardy-Weinberg Theorem.

Ans: Hardy-Weinberg Theorem: It states that the frequencies of alleles and genotypes in a population's gene pool remain constant over the generation unless acted upon by agents other than sexual recombination.

- Hardy-Weinberg equation is a binomial expansion: $(p + q)^2 = p^2 + 2pq + q^2$

Q:9 What is the difference between Endangered species and Threatened species?

Endangered species	Threatened species
A species which is in imminent danger of extinction throughout its range is called endangered species.	A threatened species is likely to become endangered in the near future.
Numbers of endangered species are less than threatened species.	Numbers of threatened species are more than endangered species.
Endangered species are at the verge of extinction.	Threatened species are not at the verge of extinction.
Endangered species in world: Cheetah, Elephant, Lion etc.	Threatened species in world: Jaguar, sea turtle, polar bear etc.
Endangered species in Pakistan: The animals in Pakistan nearing extinction are; Mammals: Indus Dolphin, Blackbuck, Common Leopard Birds: Great Indian Bustard, Houbara Bustard, white-headed duck and Marbled teal etc. Plants: More than 500 plants.	Threatened species in Pakistan: Ibex, black bear etc.

Q:10 Name any five species, declared extinct in Pakistan.

Ans: Following species have been declared extinct from Pakistan:

- 1) Cheetah
- 2) Tiger
- 3) Asian lion
- 4) Indian rhino
- 5) Cheer pheasant
- 6) Crocodile
- 7) Gavial

Important Short Answers

Q:1 Define evolution.

Ans: Evolution: Evolution is branch of biology dealing with gradual changes taking place in living organisms so as to adjust in new or changing environment over time.

OR

Evolution is a change over time, organic or biological evolution is a series of changes in the genetic composition of population over time.

OR

According to the modern definition, evolution is the change in gene frequency of a population.

Q:2 differentiate between theory of Special creation and Organic evolution.

Theory of special creation	Theory of organic evolution
According to the theory of special creation, all living things came into existence in their present forms especially created by Nature	According to the theory of organic evolution, living being gradually change whereby one may give rise to another with adaptation.
Carlous Linnaeus was the scientist who believed in divine creation.	Aristotle was the earliest believer of this concept.
It means that no changes have occurred in them since they came into existence.	All the existing organisms are modified descendants of the pre-existing ones.
Believers of the theory are called as Creationists.	Believers of this theory are called as Evolutionist.

Q: 3 What are the sources of hydrogen for reducing CO₂ in first photosynthetic organism?

Ans: The first photosynthetic organism probably used hydrogen sulphide as a source of hydrogen for reducing carbon dioxide to sugars.

Q: 4 Differentiate between Lamarckism and Darwinsim.

Lamarckism	Darwinism
According to the Lamarck: The parts of the body used extensively become larger and stronger (longer neck of giraffe), while those not used deteriorate with passage of time.	Darwinism is defined as a theory of biological evolution, explaining a concept where all species of organisms arise and develop through the natural selection of small and inherited variations which increase the ability of an individual to compete, survive, and reproduce.
Proposed by Jean de Lamarck.	Proposed by Charles Darwin.
Main postulates are: - Environmental changes - New needs - Use and disuse of organs - Development of acquired characters - Inheritance of acquired character and speciation	Main postulates are: - Over population - Limited resources (food etc.) - Struggle for existence - Development of variations, - Natural selection of the fittest - Inheritance of useful continuous variations - Speciation
Lamarckism does not believe in survival of the fittest.	Darwin's natural selection theory is based on survival of the fittest.
All the acquired characters are inherited to the next generation.	Only useful variations are transferred to the next generation.
It does not consider struggle for existence.	Struggle for existence is very important in this theory.

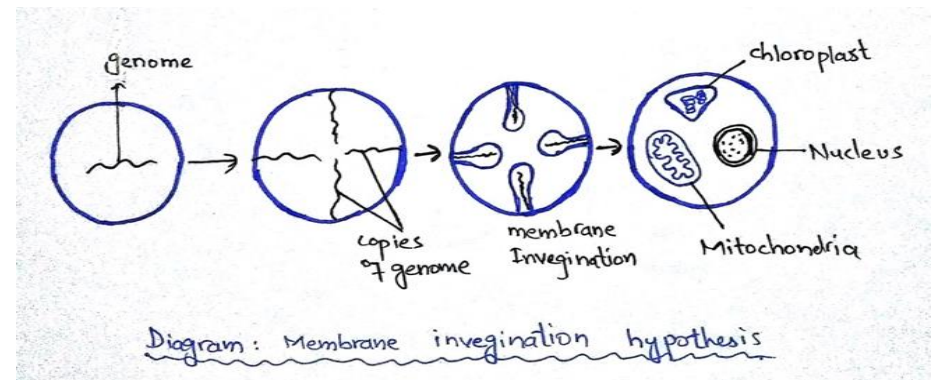
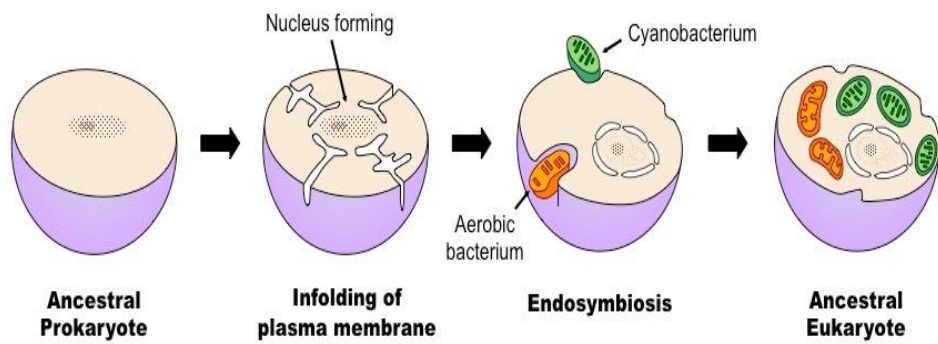
Q:5 Differentiate between Endosymbiont hypothesis and Membrane invagination hypothesis.

Endosymbiont hypothesis	Membrane invagination hypothesis
The eukaryotic cell might have evolved when a large anaerobic amoeboid prokaryotic ingested small aerobic bacteria and stabilized them instead of digesting them. This is known as endosymbiont hypothesis.	In this process the prokaryotic cell membrane invaginated so as to give rise into Eukaryotic cells.
This idea was given by Lynn Margulis.	Key contributors have been Klein and Cronquist and Cavalier-Smith.
According to this hypothesis, the aerobic bacteria develop into mitochondria which are site aerobic respiration and most energy conversion in eukaryotic cells. The possession of these mitochondria like endosymbiont brought the advantage of aerobic respiration to the host.	According to this hypothesis a prokaryotic cell duplicated its genetic material. The plasma membrane invaginated to form double membrane-bound organelles (nucleus, mitochondria, chloroplast etc.) and individual genome separate from each other.

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- The flagella have arisen through the ingestion of spirochetes.
- Ingestion of spirochete like prokaryotes like cyanobacteria would have been developed into chloroplasts in plants.

- The nuclear genome eventually enlarged while other genomes lost many of their genes resulting in a eukaryotic.



Q:6 What is Neo-Darwinism? OR What is meant by Modern synthesis?

Ans: Neo-Darwinsim: According to Neo-Darwinism, the new species evolve due to extensive genetic variation within populations and natural selection.

- The theory of evolution proposed by Darwin has been modified in the light of:
 - Population genetics
 - Variations within populations and characters therein.
- With the progress in population genetics in 1930s, Mendalism and Darwinism were reconciled and the genetic basis of variations and natural selection was worked out.
- An extensive theory of evolution was thus developed in 140s which acme to be known as the modern synthesis or Neo-Darwinism.
- It is also called synthesis because it includes discoveries and ideas from many different fields of biology, including paleontology, taxonomy, biogeography, ecology, ethology and the population genetics.

Q:7 What was the second idea of Lamarck called?

Ans: The second idea of Lamarck adopted, was called the inheritance of acquired characteristics. In this concept of heredity, the modifications an organism acquires during its lifetime can be passed along to its offspring e.g., the long neck of the giraffe.

Q:8 What was the contribution of Wallace in the development of theory of natural selection?

Ans: Alfred Wallace developed a theory of natural selection essentially identical to Darwin's. Wallace's papers, along with extracts from Darwin's unpublished 1844 essay, were presented to the Linnaean society of London on July 1, 1858.

Q:9 What was Darwin's idea of Origin of Species?

Ans: A new species would arise from an ancestral form by the gradual accumulation for adaptations to different environment, separated from original habitat by geographical barriers. Over many generations, the two populations could become dissimilar enough to be designated separate species.

Q:10 What Darwin said about Finches of Galapagos?

Ans: Among the birds Darwin collected 13 types of finches that, although quite similar, seemed to be different species. Some were unique to individual islands, while other species were distributed on two or more islands that were close together.

Q:11 What is the important turning point for evolutionary theory?

Ans: The origin of species convinced most biologists that species are products of evolution. An important turning point for evolutionary theory was the birth of population genetics, which emphasizes the extensive genetic variation within populations and recognizes the importance of quantitative characters.

Q:12 Differentiate between Homologous organs and Analogous organs.

Homologous organs	Analogous organs
• The organs that are functionally different but structurally alike are called homologous organs.	• The organs that are functionally alike but structurally different are called analogous organs.
• Adapted for different functions.	• Adapted for similar functions.
• It is due to divergent evolution.	• It is due to convergent evolution.
• It highly indicates evolutionary relationship.	• It meagerly indicates evolutionary relationship.
• Example: Forelimbs of man, bat, horse, whale etc. play different functions but have same internal structures.	• Example: Wings of bats, wins of birds and wings of insects have same functions but are different in internal structure.

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Q:13 Differentiate between Convergent and Divergent evolution.

Convergent evolution	Divergent evolution
The evolution in which organs having different origin become look alike due to similarity in functions is called convergent evolution.	The evolution in which organs having common ancestry but they look differently is called divergent evolution.
It is shown by analogous organs.	It is shown by homologous organs.
Convergent evolution occurs in organisms which are not closely phylogenetically related.	Divergent evolution occurs in phylogenetically related organisms.

Q:14 Differentiate between Natural and Artificial selection.

Natural selection	Artificial selection
Selection of traits or alleles by Nature is called Natural selection.	Selection of traits or alleles by Man is called artificial selection.
Nature selects the best alleles or characters among variations.	Man selects the best alleles or characters among variations.
Selection process is controlled by environment.	Selection process is controlled by breeders.
This follows Darwin's natural selection.	This is done by inbreeding or out breeding by man.
Changes in alleles and traits by nature are slow process.	Changes in alleles and traits by man are done in short period of time.
Example: Antibiotic resistance in bacteria, long neck of giraffe etc.	Example: Breeding of sheep, cow, rice and wheat varieties etc.

Q:15 How comparative anatomy and biogeography support evolution?

Biogeography as evidence of evolution	Comparative anatomy as evidence of evolution
The geographical distribution of species shows that many species of plants and animals which are confined to the particular island, but closely related to the species of the nearest mainland.	The anatomical similarities between species of same class support evolution e.g. forelimbs of human, cat, whales bats and all other mammals are made up of same skeletal elements, although they play different functions.
So the ancestors of these species must have migrated from mainland and due to natural selection over here, they evolved into new species.	The basic similarity of the forelimbs is the consequence of the descent of all mammals from a common ancestor.

Q:16 What does indicate that prokaryotes are ancestors of all life?

Ans: Evidence from biochemistry, molecular biology, and cell biology places prokaryotes as the ancestors of all life, and predicts that bacteria should precede all eukaryotic life in the fossil record.

Q:17 Define Gene pool and Genetic drift.

Gene pool	Genetic drift
The total aggregate of genes in a population at any one time is called population's gene pool.	It is the change in frequency of alleles at a locus that occurs by chance.
It consists of alleles at all gene loci in all individuals of the population.	In small populations, such fluctuations may lead to the loss of particular alleles.

Q:18 What is genetic drift? Give its effects.

Ans: Genetic drift: It refers to changes in allele frequencies of a gene pool purely by chance.

OR

It is the change in frequency of alleles at a locus that occurs by chance.

Effects of genetic drift:

Although genetic drift occurs in both large and small populations yet:

- A large population is not greatly affected than a smaller one.
- This may occur in a small population when a few individuals' fails to reproduce and then genes are lost from population. Genetic drift may, therefore be an important mechanism in evolutionary change in small population.

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Q:19 What is Hardy-Weinberg equation used for?

Ans: A general formula, called the Hardy-Weinberg equation is used for mathematical calculation of the frequencies of alleles and genotypes in populations at equilibrium. The evolution can only take place if the frequencies of various alleles in a population change.

For a one locus where only two alleles occur,

$$p + q = 1$$

$$(p + q)^2 = 1$$

$$p^2 + 2pq + q^2 = 1$$

Q:20 What factors affect the gene frequency?

Ans: Factors affecting the gene frequency: Following are the important factors which bring about change of gene frequencies according to Hardy-Weinberg:

- 1) Mutation
- 2) Migration
- 3) Genetic drift
- 4) Non-random mating
- 5) Selection

Q:21 Which mating is called non-random mating?

Ans: Non-random mating: Individuals with certain genotypes sometimes mate with one another more commonly than would be expected on a random basis. This is called non-random mating.

Q:22 What are extinct species?

Ans: Extinct species: The species which are no more present on this planet are regarded as extinct species.

- Extinct is when there are no living members of a species.
- **Extinct species in world:** Dinosaurs, Tasmanian tiger/Wolf
- **Extinct species in Pakistan:**
 - **Mammals:** Cheetah, Tiger, Asian lion, Indian rhino
 - **Birds:** Cheer pheasant
 - **Reptiles:** Crocodile and Gavial

Q:23 Give measures to protect endangered species.

Ans: Protections of endangered species:

- Protect the landscapes and multiple use areas. It will allow controlled private activity. Thus it will retain the habitat of wild life.
- Zoos and botanical gardens can save endangered species.
- A global system of national parks to protect large tracts of land and wild life corridors that allows movement between natural areas.
- Deserts, sub-mountainous tracts and wetlands are habitats in dangers. We must protect them rapidly.
- Endangered species of plants have been recorded to more than 500.

Exercise MCQ's

❖ **Encircle the correct answer from the multiple choices.**

- 1) **The gill pouches of mammals and birds are**
 - a) Support for “ontogeny recapitulates phylogeny”
 - b) Homologues structure
 - c) Used by the embryos to breathe
 - d) Evidence for degeneration of unused body parts
- 2) **Darwin’s theory, as presented in The Origin of Species, mainly concerned:**
 - a) How new species arise
 - b) How adaptation evolved
 - c) The origin of life
 - d) How extinction occur
 - e) The genetics of evolution
- 3) **The smallest biological unit that can evolve over time is:**
 - a) A particular cell
 - b) An individual organism
 - c) A population
 - d) A species
 - e) An ecosystem
- 4) **A gene pool consists of:**
 - a) All the allele exposed to natural selection
 - b) The total of all allele present in a population
 - c) The entire genome of a reproducing individual
 - d) All the gametes in a population
 - e) Frequencies of alleles for a gene locus within a population
- 5) **In a population with two alleles for a particular locus, B and b the allele frequency of B is 0.7. What would be the frequency of heterozygote if the population is in Hardy-Weinberg equilibrium?**
 - a) 0.7
 - b) 0.42
 - c) 0.49
 - d) 0.09
 - e) 0.21
- 6) **In a population that is in Hardy-Weinberg equilibrium, 16% of the individuals show the recessive trait. What is the frequency of dominant allele in the population?**
 - a) 0.84
 - b) 0.36
 - c) 0.6
 - d) 0.4
 - e) 0.48
- 7) **Selection acts directly on:**
 - a) Phenotype
 - b) Genotype
 - c) The entire genome
 - d) Each allele
 - e) The entire gene pool

Answer key:

1	a	2	a	3	d	4	b	5	b
6	c	7	e						

Important Additional MCQ's

❖ Encircle the correct answer from the multiple choices.

Evolution & Early hypothesis

- 1) The process that has transformed life on earth from its earliest forms to vast diversity is:
a) Mutation b) Evolution c) Migration d) Genetic drift
- 2) Which scientist believed in divine/special creation?
a) Linnaeus b) Darwin c) Lyell d) Cuvier
- 3) The first person who argued with evidence that species have undergone evolution and were not spontaneously created:
a) Aristotle b) Darwin c) Linnaeus d) Lamarck
- 4) Lyell published the principle of
a) Population b) Community c) Geology d) Ecology
- 5) Which scientist does not match his achievements?
a) Lamarck published his theory of evolution
b) Lyell published principles of geology
c) Malthus published essay on principle of population
d) Cuvier published papers on inheritance
- 6) Who published an essay on "The principle of population"?
a) Lyell b) Darwin c) Malthus d) Mendel
- 7) Alfred developed a theory of natural selection essentially identical to:
a) Linnaeus's b) Darwin's c) Lamarck's d) Mendel's
- 8) A group of bacteria that can tolerate temperature up to 120°C:
a) Eubacteria b) Mycoplasma c) Archeobacteria d) E.coli
- 9) Archeobacteria can tolerate temperature about:
a) 45°C b) 85°C c) 100°C d) 120°C
- 10) Eukaryotes are thought to have appeared about:
a) 3.5 billion years b) 1.5 billion years c) 420 million years d) 150 million years
- 11) Prokaryotes are considered to be evolved:
a) 3.5 billion years ago b) 1.5 billion years ago c) 4.5 billion years ago d) 1000 million years ago
- 12) Endosymbiont hypothesis explains origin of:
a) Eukaryotes b) Prokaryotes c) Armadillo d) All
- 13) According to Endosymbiont hypothesis, the aerobic bacteria developed into:
a) Ribosome b) Lysosome c) Mitochondria d) Golgi Apparatus
- 14) Flagella may have arisen through the ingestion of prokaryotes similar to spiral shaped bacteria called:
a) E.coli b) Streptococcus c) Spirochete d) Rhizobium
- 15) What was the source of hydrogen for first photosynthetic organisms?
a) Water b) Hydrogen present in soil c) Hydrogen sulphate d) Hydrogen sulphide

Lamarckism and Darwinism

- 16) Acquired characteristics of an individual, cannot be:
a) Inherited b) Flourished c) Lost d) Migrated
- 17) Inheritance of acquired characteristics was proposed by:
a) Darwin b) Mendel c) Lamarck d) Malthus
- 18) Charles Darwin gave the:
a) Theory of special creation
b) Theory of natural selection
c) Inheritance of acquired characters
d) Cell theory
- 19) Book "The Origin of species" was written as:
a) 1840 b) 1859 c) 1865 d) 1890
- 20) Darwin's "The Origin of Species" was written by:
a) Linnaeus b) Darwin c) Lamarck d) Wallace
- 21) Who published papers on inheritance?
a) Malthus b) Cuvier c) Lyell d) Mendel
- 22) Important point/s of Lamarck's theory:
a) Use and disuse of organs
b) Inheritance of acquired characters
c) Natural selection
d) Both a and b
- 23) Who developed a theory of natural selection essentially identical to Darwin's:
a) Hardy-Weinberg b) Alfred Wallace c) Malthus d) Lyell
- 24) Neo-Darwinism has integrated discoveries and ideas from:
a) Taxonomy b) Paleontology c) Genetics d) All of these

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25) Adaptations that an organism acquires by its own actions are:

- a) Heritable
- b) Not heritable
- c) Can be made heritable through some modifications
- d) Both heritable and not heritable

26) The ultimate source of organic variations is:

- a) Sexual reproduction
- b) Hormonal action
- c) Natural Selection
- d) Mutation

27) Best suited examples given in favor of Lamarckian Theory are:

- a) Elongation of neck and fore limbs of African giraffe
- b) Loss of limbs in snakes
- c) Both (a) & (b)
- d) None of these

28) Neck and fore limbs in African giraffe increased in length as a result of:

- a) Variation in these organs
- b) Mutations in these organs
- c) Use and disuse
- d) None of these

29) Which of the following facts definitely casts doubt on Lamarckian theory:

- a) Snakes lost their limbs due to burrowing mode of life
- b) Neck and fore limbs of African giraffe use for generations
- c) Vestigial organs were functional ones but now undergone degeneration due to loss of their function
- d) Blacksmith's son does not have powerful arm muscles as his father

30) Which of the following concepts is attributed to Lamarck:

- a) Struggle for existence
- b) Survival of the fittest
- c) Inheritance of acquired characters
- d) Cells come from pre-existing cells

31) Which of the following theories of evolution can best explain the vestigial organs:

- a) Darwinism
- b) Lamarckism
- c) Natural selection
- d) Special creation

32) Which of the following facts is not correct about Lamarckism in the light of current scientific knowledge:

- a) All the characters acquired by the individuals during life time and inherited
- b) Organs used more by the organism grow more in size
- c) Both (a) & (b)
- d) None of these

33) Which of the following features are raw materials in evolution according to Darwin's Theory:

- a) Intra-specific character
- b) Acquired variations
- c) Acquired capabilities
- d) Inherited variation

34) The processes associated with evolution of a species collectively mean:

- a) Natural Selection
- b) Heredity
- c) Mutation
- d) Adaptation

35) Which of the following concepts is attributed to Charles Darwin:

- a) All the characters acquired by the organisms in their life time are inherited
- b) The cell come from pre-existing cells
- c) In the struggle for existence, the fittest individuals survive
- d) Use and disuse of organs is important in evolution

36) Darwinism can be explained briefly by a chart consisting of observed facts and deductions which was drawn jointly by:

- a) Darwin and Charles Lyell
- b) Darwin and Malthus
- c) Darwin and Morgan
- d) Darwin and Wallace

37) Which of the following is associated with name of Darwin:

- a) Philosophic Zoologique
- b) Special Creation
- c) Variation
- d) Galapagos' islands

38) Ship on which Darwin travelled was:

- a) Beagle
- b) Begle
- c) Baegle
- d) Bieggle

Evidences of Evolution

39) Biogeography is the geographical distribution of:

- a) Phylum
- b) Species
- c) Classes
- d) Genera

40) Armadillo, the armored mammals live only in:

- a) Europe
- b) America
- c) Australia
- d) Asia

41) The Armadillo mammal that live only in America is:

- a) Echinda
- b) Pangolin
- c) Porcupine
- d) Armadillo

42) organs are functionally but structurally alike:

- a) Analogous
- b) Homologous
- c) Unilogous
- d) Hypologus

43) Which of the following is vestigial organ of a whale:

- a) Pelvis
- b) Leg bones
- c) Lungs
- d) Pelvis & leg bones

44) Which of the following organs serve no apparent purpose:

- a) Vestigial organs
- b) Non vestigial organs
- c) Homologous organs
- d) Analogous organs

45) The actual remains or traces of organisms that lived in ancient geological times:

- a) Vestigial remains
- b) Fossils
- c) Fuel
- d) None of these

46) Most fossils are found in the:

- a) Metamorphic rocks
- b) Soil
- c) Sedimentary rocks
- d) Volcanic mountains

47) Which statement is incorrect?

- a) Homologous organs are functionally different but structurally alike
- b) Analogous organs are functionally different but structurally alike
- c) Examples of homologous structures are arms of man, forelimb of cat, flipper of whale
- d) Examples of analogous structures are wings of bats, birds and insects

48) Analogous organs show:

- a) Convergent evolution
- b) Divergent evolution
- c) Straight evolution
- d) Zig-zag evolution

49) The comparative embryology of all vertebrates development of:

- a) Mars
- b) Stales
- c) Gill pouches
- d) Fins

50) In terrestrial vertebrates, gill pouches develop into:

- a) Gills
- b) Lungs
- c) Nose
- d) Eustachian tube

51) Tubes that connect the middle ear with throat in humans are:

- a) Eustachian tube
- b) Neural tube
- c) Fallopian tube
- d) Nephridial tube

52) In human, Eustachian tubes connect middle ear with:

- a) Nose
- b) Eye
- c) Throat
- d) Brain

53) Gill pouches in human develop into:

- a) Eustachian tube
- b) Larynx
- c) Syrinx
- d) Pharynx

54) The branch of biology that provides evidence through fossil record is called:

- a) phycology
- b) Biogeography
- c) Comparative anatomy
- d) Paleontology

55) Respiratory proteins found in aerobic species is:

- a) Cytochrome a
- b) Cytochrome b
- c) Cytochrome c
- d) Cytochrome a3

Artificial selection, Hardy Weinberg Theorem

56) A full set of genes of an individual is called:

- a) Genome
- b) Genotype
- c) Karyotype
- d) Dominance

57) In natural selection the environment plays role affecting the proportions of gene in:

- a) Population
- b) Community
- c) Area
- d) Biome

58) A group of interbreeding individuals belonging to a particular species and sharing a common geographical area is called:

- a) Community
- b) Population
- c) Ecosystem
- d) Biosphere

59) Hardy-Weinberg theorem describe the frequencies of genotype of non-evolving:

- a) Family
- b) Population
- c) Species
- d) Community

60) Some individuals leave behind more progeny than others and the rate at which they do so is affected by their inherited characteristics, this is called:

- a) Non-random mating
- b) Selection
- c) Mutation
- d) Migration

61) Ultimate sources of all evolutionary changes affecting gene frequency:

- a) Selection
- b) Migration
- c) Mutation
- d) Genetic drift

62) The change in frequency of alleles at a locus that occurs by chance is:

- a) Gene pool
- b) Mutations
- c) Migration
- d) Genetic drift

63) Emigration and immigration of members of a population cause disturbance in the:

- a) Genotype
- b) Phenotype
- c) Gene pool
- d) Genetic drift

64) One of the factors given below does not affect gene frequency:

- a) Mutation
- b) genetic drift
- c) Migration
- d) Food

65) Genetic drift is on account of:

- a) Variations
- b) Mutation
- c) Increased population
- d) Decreased population

66) Natural selection can amplify or diminish variations that are:

- a) Non heritable
- b) Heritable
- c) Both heritable & non-heritable
- d) Acquired

67) Adaptations that an organism acquires by its own actions are:

- a) Heritable
- b) Not heritable
- c) Can be made heritable through some modifications
- d) Both heritable and not heritable

68) The total aggregate of genes in a population at any one time is called population's:

- a) Genome
- b) Genomic library
- c) Genetic group
- d) Gene pool

69) If all members of a population are homozygous for the same allele, that allele is said to be:

- a) Fixed in gene pool
- b) Mobile in gene pool
- c) Random in gene pool
- d) Stationary in gene pool

70) According to Hardy-Weinberg theorem, frequencies of alleles and genotypes in a population's gene pool remain:

- a) Mobile
- b) Stationary
- c) Constant
- d) Constant unless acted upon by agents other than sexual recombination

71) Disturbance in the gene pool is created by:

- a) Emigration
- b) Immigration
- c) Both a and b
- d) Panmigration

72) Which of the following processes had resulted in the production of different breeds of domestic dogs and pigeons?

- a) Natural selection
- b) Cross breeding
- c) Artificial selection
- d) Self -breeding

73) If we consider Hardy-Weinberg law, then following is incorrect in its sense:

- a) Mutations cause changes in genetic frequency
- b) Migration changes allelic frequency
- c) There should not be selection
- d) Non-random mating will reduce chances of evolution

Wildlife

74) A species in imminent danger of extinction throughout its range is:

- a) Scarce species
- b) Threatened species
- c) Rare species
- d) Endangered species

75) In Pakistan, among the animals declared extinct is:

- a) White headed duck
- b) Marbled teal
- c) Crocodile
- d) Houbara bustard

76) Zoos and botanical gardens are to save species extinction is:

- a) Permanent
- b) Dominant
- c) Imminent
- d) Prominent

77) Endangered species of plants have been recorded to more than:

- a) 300
- b) 400
- c) 500
- d) 600

Answer key:

1	b	2	a	3	a	4	c	5	d	6	c	7	b	8	c	9	d	10	b
11	a	12	a	13	c	14	c	15	d	16	a	17	c	18	b	19	b	20	b
21	d	22	d	23	b	24	d	25	b	26	a	27	c	28	c	29	d	30	c
31	b	32	c	33	a	34	a	35	c	36	d	37	d	38	a	39	b	40	b
41	d	42	b	43	d	44	a	45	b	46	c	47	b	48	a	49	c	50	d
51	a	52	c	53	a	54	d	55	c	56	a	57	a	58	b	59	b	60	b
61	c	62	d	63	c	64	d	65	d	66	b	67	b	68	d	69	a	70	d
71	c	72	c	73	d	74	d	75	c	76	c	77	c						

Past MDCAT MCQ's

2008

1) Organs are functionally different but structurally alike:

- a) Analogous b) Homologous c) Unilugous d) Hypologous

2009

2) The survival of an organism during the struggle for existence is not random, but depends on:

- a) Its genetic constitution
b) Its ability to over-produce
c) Its ability to acquire characters
d) Its ability to over-eat

3) Evolutionary relationships amongst species are reflected in their:

- a) DNA and proteins b) DNA and gene c) RNAs and proteins d) DNA and RNAs

4) If all the members of a population are homozygous for the same allele, that allele is said to be:

- a) Random in population's pool
b) Random in a species
c) Fixed in population's pool
d) Fixed in the gene pool

2012

5) The comparative embryology of all vertebrates shows development of:

- a) Hairs b) Scales c) Gill pouches d) Fins

2013

6) The structures which are reduced during the course of evolution and have no apparent function are called:

- a) Regenerated organs b) Saltatory organs c) Vestigial organs d) Useless organs

2015

7) From evolutionary point of view, which respiratory protein is common in many organisms?

- a) Cytochrome a b) Cytochrome c c) Cytochrome b d) Cytochrome d

2016

8) The total number of genes in a population is called:

- a) Gene pool b) Genome c) Allele pool d) Genomic library

9)is the branch of Biology used for the identification and interpretation of fossils.

- a) Evolution b) Zoogeography c) Paleontology d) Biodiversity

10) Which one of the following is considered as strong evidence of evolution?

- a) Embryology Record b) Biochemical Record c) Molecular Record d) Fossil Record

11) Structures found in different species which are believed to have a common evolutionary origin are called:

- a) Homologous b) Vestigial c) Analogous d) Fossilized

2017

12) Process by which unrelated species evolve to functionally resemble each other is called:

- a) Convergent evolution b) Co-evolution c) Divergent evolution d) Parallel evolution

13) W.O.F shows evidences from evolution through molecular biology:

- a) Development of bronchial arches in vertebrate embryo
b) Distribution of species
c) Comparison of genes and proteins in different species
d) Study of vestigial organs

14) Large population size, random mating, no mutation and no emigration or immigration are the postulates of:

- a) Hardy-Weinberg theorem
b) Mendel's law of segregation
c) Mendel's law of independent assortment
d) Theory presented by Schleiden and Schwann

Answer key:

1	b	2	a	3	a	4	d	5	c
6	c	7	b	8	a	9	c	10	d
11	a	12	a	13	c	14	a		