

**Ravi Maths Tuition Centre**

**12TH CBSE Evolution MCQ**

12th Standard

**Biology**

Time : 00:01:00 Hrs

Total Marks : 1

MCQ

163 x 1 = 163

1) Which of the following walked like gorillas and chimpanzees?

**(a) Dryopithecus** (b) Ramapithecus (c) Both (a) and (b) (d) Australopithecus

2) The turtle and tortoise evolved from

(a) Amphibians (b) Fishes (c) Mammals **(d) None of these**

3) Which of the following evolved first

(a) Homo Sapiens (b) Homo habilis (c) Homo erectus **(d) Tyrannosaurus**

4) Which of the following walked upright?

(a) Dryopithecus **(b) Ramapithecus** (c) Both (a) and (b) (d) Australopithecus

5) Presence of gills in the tadpole of frog indicates that

(a) fishes evolved from frog-like ancestors (b) frogs will have gills in future

**(c) frogs evolved from gilled ancestors** (d) fishes were amphibious in the past

6) Which of the following is a living fossil?

(a) Moss (b) Saccharomyces (c) Spirogyra **(d) Cyas**

7) Diversification in plant life appeared

(a) due to abrupt mutation (b) suddenly on earth (c) by seed dispersal

**(d) due to long periods of evolutionary changes**

8) Age of fossils in the past was generally determined by radiocarbon method and other methods involving radioactive elements found in the rocks. More precise methods, which were used recently and led to the revision of the evolutionary periods for different groups of organisms, includes

(a) study of the conditions of fossilization

**(b) electron spin resonance(ESR) and fossil DNA**

(c) study of carbohydrates/proteins in rocks

(d) study of carbohydrates/proteins in fossils

9) A baby has been born with a small tail. It is a case exhibiting

(a) retrogressive evolution (b) mutation **(c) atavism** (d) metamorphosis

10) The most likely reason for the development of resistance against pesticides in insects damaging the crops is

(a) genetic recombination (b) directed mutation **(c) acquired heritable changes**

(d) random mutation

11) Which one of the following experiments suggest that simplest living organism could not have originated spontaneously from non-living matter?

(a) larvae could appear in decaying organic matter

(b) microbes did not appear in stored meat

(c) microbes appeared from unsterilized organic matter

**(d) meat was not spoiled, when heated and kept sealed in a vessel**

12) De Vries gave his mutation theory on organic evolution while working on

(a) *Pisum sativum* (b) *Drosophila melanogaster* **(c) *Oenothera lamarckiana***

(d) *Althea rosea*

13) Which one of the following phenomenon supports Darwin's concept of natural selection in organic evolution?

(a) development of transgenic animals (b) production of 'Dolly', the sheep by cloning

**(c) prevalence of pesticide resistant insects**

(d) development of organs from 'stem cells' for organ transplantation

14) Which of the following is the relatively most accurate method of dating of fossils?

(a) radio-carbon method (b) potassium-argon method

**(c) electron-spin resonance method** (d) uranium-lead method

15) The biogenetic law of Haeckel is

(a) *Omnis vivum-e-vivum* (b) *Omnis cellula-e-cellula*

**(c) Ontogeny repeats phylogeny** (d) Phylogeny repeats ontogeny

16) Birbal Sahni Institute of Palaeobotany is located at

(a) Delhi    **(b) Lucknow**    (c) Dehradun    (d) Kolkata

17) 3-5 billion years ago, which flora dominated the earth?

(a) Archaeobacteria    (b) Mosses    (c) Lichens    **(d) Blue-green algae**

18) Huan ancestors who left cave painting were

(a) neanderthal man    **(b) cromagnon man**    (c) Java apeman    (d) pecking man

19) An important evidence in favour of organic evolution is the occurrence of

(a) homologous and analogous organs    **(b) homologous and vestigial organs**

(c) analogous and vestigial organs    (d) homologous organs only

20) Evolutionary history of an organism is known as

(a) ontogeny    **(b) phylogeny**    (c) ancestry    (d) paleontology

21) A connecting link between reptiles and birds is

(a) Dimetrodon    (b) Dodo    **(c) Archaeopteryx**    (d) Sphenodon

22) Ultimate source of organic variation is the process which provides raw materials for evolution is

(a) Sexual reproduction    (b) meiosis    **(c) mutation**    (d) independent assortment

23) The prehistoric man which lived on earth during late Pleistocene period

**(a) Neanderthal man**    (b) Australopithecus    (c) CroMagnon    (d) Atlantic man

24) According to the theory of mutation by Hugo de Vries

(a) only small mutation takes part in variation

(b) only large mutation takes part in variation

**(c) both small and large mutation cause variation in species**    (d) none of the above

25) A living connecting link which provides evidences for organic evolution is

(a) Sphenodon between reptile and bird    (b) lung fishes between pisces and reptile

(c) Archaeopteryx between reptile and bird

**(d) duck-billed platypus between reptiles and mammals**

26) Which of the following are not analogous organs?

(a) fins of fishes and flippers of whales    (b) stings of honey bee and scorpion

**(c) thorn of Bougainvillea and tendril of Cucurbita**

(d) wings of insect and wings of pterodactyl

27) On the basis of hereditary material, most closest relative of man is

**(a) chimpanzee**    (b) gorilla    (c) orangutan    (d) gibbon

28) Peripatus is a connecting link between

(a) Coelenterates and Porifera    (b) Ctenophora and Platyhelminthes

(c) Mollusca and Echinodermata    **(d) Annelida and Arthropoda**

29) In the case of peppered moth (*Biston betularia*) the black-coloured form became dominant over the light-coloured form in England during industrial revolution. This is an example of

(a) inheritance of dark colour character acquired due to the darker environment

**(b) natural selection whereby darker forms were selected**

(c) appearance of the darker coloured individuals due to very poor sunlight

(d) protective mimicry

30) Jurassic period of the mesozoic era is characterized by

(a) flowering plants and first dinosaurs appear

**(b) gymnosperms are dominant plants and first birds appear**

(c) radiation of reptiles and origin of mammal like reptiles

(d) dinosaurs become extinct and angiosperms appear

31) Which of the following provides most evident proof of evolution?

**(a) fossils**    (b) morphology    (c) embryo    (d) vestigial organs

32) The diversity in the type of beak of finches adapted to different feeding habits on the Galapagos islands, as observed by Darwin, provides evidence for

**(a) Origin of species by natural selection**    (b) Intraspecific variation

(c) Intraspecific competition    (d) Interspecific competition

33) The unit of natural selection is

**(a) an individual**    (b) a species    (c) a genus    (d) a population

34) The age of fossils is determined by

- (a) **analysis of bones** (b) radioactive C<sup>14</sup> dating (c) electron microscopy  
(d) weighing the fossils

35) Which of the following was likely to have been absent in a molecule state ,in the primitive atmosphere of the earth?

- (a) carbon (b) **oxygen** (c) hydrogen (d) nitrogen

36) The concept of chemical evolution is based on

- (a) interaction of water,air and clay under intense heat  
(b) water of solar radiation on chemicals

(c) **possible origin of life by combination of chemicals under suitable environmental conditions**

- (d) crystalization of chemicals

37) Galapagos islands are associated with the name of

- (a) Wallace (b) Malthus (c) **Darwin** (d) Lamarck

38) In the developmental history of mammalian heart, it is observed that it passes through a 2-chambered fish-like heart, 3-chambered frog-like heart and finally 4-chambered stag. To which hypothesis can the above statement be approximated?

- (a) **Biogenetic law** (b) Hardy-Weinberg law (c) Lamarck's principle  
(d) Mendelian principles

39) Fossils are generally found in:

- (a) **Sedimentary rocks** (b) Igneous rocks (c) Metamorphic rocks  
(d) Any type of rock

40) For the MN-blood group system, the frequencies of M and N alleles are 0.7 and 0.3, respectively. The expected frequency of MN-blood group bearing organisms is likely to be

- (a) **42%** (b) 49% (c) 9% (d) 58%

41) Which type of selection is industrial melanism observed in moth, Biston bitularia:

- (a) Stabilising (b) **Directonal** (c) Disruptive (d) Artificial

42) The most accepted line of descent in human evolution is:

- (a) Australopithecus - > Ramapithecus - > Homo sapiens - > homo habilis
- (b) Homo erectus - > homo habilis - > Homo sapiens
- (c) Ramapithecus - > Homo habilis - > Homo erectus - > Homo sapiens**
- (d) Australopithecus - > Ramapithecus - > Homo erectus - > Homo habilis - > Homo sapiens.

43) Which of the following is an example for link species?

- (a) Lobe fish**    (b) Dodo bird    (c) Sea weed    (d) Tyrannosaurus rex

44) Which one of the following statements is correct?

- (a) there is no evidence of existence of gills during embryogenesis of mammals
- (b) all plant and animal cells are totipotent    **(c) ontogeny repeats phylogeny**
- (d) stem cells are specialized cells

45) The finches of Galapagos islands provide an evidence in favour of

- (a) evolution due to mutation    (b) retrogressive evolution
- (c) biogeographical evolution**    (d) special creation

46) The connecting link between Annelida and Mollusca is

- (a) Neopalina**    (b) Glochidium larva    (c) Nautilus    (d) Velliger larva

47) The idea of natural selection as the fundamental process of evolutionary changes was reached

- (a) By Alfred Russel Wallace in 1901
- (b) Independently by Charles Darwin and Alfred Russel Wallace in 1859**
- (c) Independently by Charles Darwin and Alfred Russel Wallace in 1901
- (d) By Charles Darwin in 1866

48) When two species of different genealogy come to resemble each other as a result of adaptation, the phenomenon is termed

- (a) macroevolution    (b) Co-evolution    **(c) Convergent evolution**
- (d) divergent evolution

49) Evolution can be studied now in action in

- (a) sphenodon    (b) Archaeopteryx    **(c) Peppered moth**    (d) Paramecium

50) Among the human ancestors, the brain size was more than 100 cc in

(a) Homo erectus (b) Ramapithecus (c) Homo habilis **(d) Homo neanderthalensis**

51) Genetic drift operates only in

(a) Island populations **(b) Smaller populations** (c) Larger populations

(d) Mendelian populations

52) Species occurring in different geographical areas are called

(a) Sibling (b) Neopatric (c) Sympatric **(d) Allopatric.**

53) Which of the following statements is correct?

(a) Cro-Magnon man's fossil has been found in Ethiopia

(b) Australopithecus is the real ancestor of modern man

(c) Homo erectus is the ancestor of man

**(d) Neanderthal man is direct ancestor of homo sapiens**

54) Abiogenesis occurred about ..... billion years ago.

(a) 1 · 2 (b) 1 · 5 (c) 2 · 5 **(d) 3 · 5**

55) A bacterial culture is treated with streptomycin and a cast is made. A few colonies are able to survive due to

(a) selection **(b) Adaptation** (c) Induced mutation (d) Mimicry

56) Industrial melanism as observed in peppered moth proves that

(a) the melanic form of the moth has no selective advantage over lighter form in industrial area

(b) the lighter form of moth has no selective advantage either in polluted industrial area or non-polluted area

(c) melanism is a pollution-generated feature

**(d) the true black melanic forms arise by a recurring random mutation**

57) Human evolution originated in

**(a) Africa** (b) Jawa (c) France (d) China

58) The surprise products in the Miller's experiment were

(a) Peptides (b) Nucleotides (c) Nucleic acids **(d) Amino acids.**

59) Adaptive radiation refers to

**(a) evolution of different species from a common ancestor**

- (b) migration of member of a species to different geographical areas
- (c) Power of adaptation in an individual to a variety of environments
- (d) adaptation due to geographical isolation

60) First mammal occurred in which Era-period?

- (a) Permian-Palaeozoic    **(b) Triassic-Mesozoic**    (c) Tertiary-Coenozoic
- (d) None of these

61) Which one is linked to evolution?

- (a) Extinction**    (b) Competition    (c) Variation    (d) Reproduction

62) Archaeopteryx is a connecting link between

- (a) reptiles and birds**    (b) birds and mammals    (c) amphibians and reptiles
- (d) None of these

63) Which of the following is not a concept of Lamarck?

- (a) environmental pressure causes variation
- (b) rate and survival of organism is different due to variation**
- (c) inheritance of acquired character
- (d) if an organ is used constantly it will continuously increase in size

64) Thorn of Bougainvillea and tendril of Cucurbita are examples of

- (a) vestigial organs    (b) retrogressive evolution    (c) analogous organs
- (d) homologous organs**

65) Darwin's theory states that

- (a) characters are acquired through inheritance
- (b) Nature select species which can adapt**
- (c) Species changes morphologically with nature    (d) Affect of environment on evolution

66) Select the correct statements from the following?

**(a) Fitness is the end result of the ability to adapt and gets selected by nature**

- (b) All mammals except whales and camels have seven cervical vertebrae
- (c) Mutations are random and directional
- (d) Darwinian variations are small and directionless

67) Match the scientists listed under column 'A' with ideas listed in column 'B'.

Column 1	Column 2
(i) Darwin	(M) abiogenesis
(ii) Oparin	(N) use and disuse of organs
(iii) Lamarck	(O) continental drift theory
(iv) Wagner	(P) evolution by natural selection

- (a) (i)-(M) ; (ii)-(P) ; (iii)-(N) ; (iv)-(O)    **(b) (i)-(P) ; (ii)-(M) ; (iii)-(N) ; (iv)-(O)**
- (c) (i)-(N) ; (ii)-(P) ; (iii)-(O) ; (iv)-(M)    (d) (i)-(P) ; (ii)-(O) ; (iii)-(N) ; (iv)-(M)

68) In 1953 S.L. Miller created primitive earth conditions in the laboratory and gave experimental evidence for origin of first form of life from pre-existing non-living organic molecules. The primitive earth conditions created include:

- (a) low temperature, volcanic storms, atmosphere rich in oxygen
- (b) low temperature, volcanic storms, reducing atmosphere
- (c) high temperature, volcanic storms, non-reducing atmosphere
- (d) high temperature, volcanic storms, reducing atmosphere containing  $CH_4$  ,  $NH_3$  etc.,**

69) What is common to whale, seal and shark?

- (a) thick subcutaneous fat    **(b) convergent evolution**    (c) homeothermy
- (d) seasonal migration

70) Variation during mutations of meiotic recombinations are:

- (a) random and directionless**    (b) random and directional    (c) random and small
- (d) random, small and direction

71) One of the Important consequences of geographical isolation is

- (a) preventing speciation    **(b) speciation through reproductive isolation**
- (c) random creation of new species    (d) no change in the isolated fauna

72) Who demonstrated existence of life in the boiled broth flask?

- (a) Darwin    **(b) Pasteur**    (c) Francisco Redi    (d) None of these

73) Who did an experiment to prove that the organic compounds were basis of life?

(a) Darwin (b) Melwin Calvin (c) Sydney Fox **(d) Miller and Urey**

74) Chemical theory of origin of life was given by

(a) Stanley Miller (b) Spallanzani **(c) Oparin and Haldane** (d) Louis Pasteur

75) Wings of pigeon, bat and mosquito exhibit the phenomenon called

**(a) Convergent evolution** (b) Divergent evolution (c) Atavism (d) All of these

76) Adaptive similarities in different animals living in the same habitat is called

(a) Retrogressive evolution (b) Parallel evolution (c) Adaptive radiation

**(d) Convergent evolution**

77) Development of patagia in animals is..... adaptation

**(a) Volant** (b) Arboreal (c) Aquatic (d) Cave

78) First organism to evolve on the earth were

(a) Saprotrophs (b) Photoautotrophs (c) Chemoautotrophs **(d) Chemoheterophs**

79) The book Philosophie Zoologique was written by

(a) Wallace (b) Oparin **(c) Lamarck** (d) Darwin

80) Which evolutionary book is most accepted worldwide after bible?

(a) philosophic Zoologique,Lamarck (b) Origin of Life, Oparin

**(c) Origin of species,Darwin** (d) Mutation and Origin of Species,devries

81) Cranial capacity is minimum in

(a) Chimpanzee (b) Gorrilla **(c) Rhesus monkey** (d) Orangutan

82) Darwin's finches are an excellent example of

(a) brood parasitism (b) connecting links **(c) adaptive radiation**

(d) seasonal migration

83) Which one of the following is incorrect about the characteristics of protobionts (coacervates and microspheres) as envisaged in the abiogenic origin of life?

- (a) they were partially isolated from the surroundings
- (b) they could maintain an internal environment
- (c) they were able to reproduce**
- (d) they could separate combinations of molecules from the surroundings

84) Which one of the following scientist's name is correctly matched with the theory put forth by him?

- (a) De Vries-Natural selection
- (b) Mendel-Theory of Pangenesis

**(c) Weismann-Theory of continuity of germplasm**

- (d) Pasteur-Inheritance of acquired characters

85) Match the scientists and their contributions in the fields of evolution

Name of the Scientist	Contributions
(A) Charles Darwin	(1) Mutation theory
(B) Lamarck	(2) Germplasm theory
(C) Hugo De Vries	(3) Philosophie Zoologique
(D) Ernest Haeckel	(4) The origin of species
(E) August Weismann	(5) Biogenetic law
	(6) Essay on populations

**(a) A-4,B-3,C-1,D-5,E-2** (b) A-4,B-3,C-5,D-1,E-6 (c) A-4,B-4,C-5,D-3,E-1

(d) A-2,B-3,C-1,D-5,E-2 (e) A-3,B-4,C-1,D-5,E-2

86) Given below are four statements (A-D) each with one or two blanks. Select the option which correctly fills up the blanks in two statements.

- (A) Wings of butterfly and birds look alike and are the results of (i) evolution.
- (B) Miller showed that  $CH_4$ ,  $H_2$ ,  $NH_3$  and (i), When exposed to electric discharge in a flash resulted in formation of (ii)
- (C) Vermiform appendix is a (i) organ and an (ii) evidence of evolution.
- (D) According to Darwin evolution took place due to (i) and (ii) of the fittest.

**(a) (D)-(i) small variations, (ii) survival, (A)-(i) convergent.**

- (b) (A)-(i) convergent, (B)-(i) oxygen, (ii) Nucleosides
- (c) (B)-(i) water vapour, (ii) Amino acids, (C)-(i) Rudimentary, (i) Anatomical.
- (d) (C)-(i) vestigial, (ii) Anatomical, (D)-(i) Mutations, (ii) Multiplication.

87) According to Darwin, evolution is

- (a) a slow, sudden and discontinuous process.
- (b) a slow and discontinuous process.
- (c) a sudden but discontinuous process
- (d) a slow, gradual and continuous process**

88) The scientific name of Java man is

- (a) Homo habilis    (b) Homo sapiens neanderthalensis    **(c) Homo erectus erectus**  
(d) Australopithecus boisei

89) The golden age of reptiles is

- (a) Palaeozoic    **(b) Mesozoic**    (c) Cenozoic    (d) Proterozoic

90) In the phylogeny of horse, the earliest fossil form is

- (a) Eohippus**    (b) Merychippus    (c) Meshippus    (d) Equus

91) Lamarck's theory of evolution is also called

- (a) Survival of the fittest    (b) Special creation theory  
**(c) Inheritance of acquired characters**    (d) None of these

92) Hardy-Weinberg equilibrium is known to be affected by

- (a) evolution    (b) limiting factors    (c) saltation    **(d) natural selection**

93) Industrial melanism was highlighted by

- (a) Mimosa pudica    (b) Triticum aestivum    **(c) Biston betularia**    (d) rock python

94) This is not Darwinian concept

- (a) variations    (b) struggle for existence    (c) natural selection  
**(d) survival of the fittest**

95) The closest primate to humans is

- (a) Gorilla**    (b) Orangutan    (c) Lemur    (d) Rhesus monkey

96) Swan-necked flask experiment was done by

- (a) Aristotle    (b) Francesco Redi    **(c) Louis Pasteur**    (d) Robert Koch

97) Hominids originated during

- (a) Pliocene**    (b) Palaeocene    (c) Miocene    (d) Oligocene

98) The theory of spontaneous generation was proposed by:

- (a) Spallanzani    **(b) Von Helmont**    (c) F. Redi    (d) Louis Pasteur

99) Which is the most advanced theory of origin of life?

(a) Spontaneous (b) Catastrophic **(c) Oparin and Haldane** (d) Non-spontaneous

100) Which of the following were first evolved organism?

(a) Chemoautotrophs **(b) Chemoheterotrophs** (c) Cyanobacteria (d) Bacteria

101) Postanal tail can be traced in

**(a) cobra** (b) Earthworm (c) Scorpion (d) Centipede

102) One of the oldest, best preserved and most complete hominid fossil commonly known as 'Lucy' belongs to the genus

(a) Oreopithecus (b) Dryopithecus (c) Pithecanthropus **(d) Australopithecus**

103) Which one of the following ancestors of man first time showed bipedal movement?

**(a) Australopithecus** (b) Cro-magnon (c) Java apeman (d) Peking man

104) Who was the first to discard the idea of fixity of species?

**(a) Jean Baptist Lamarck** (b) Charles Darwin (c) Robert Hooke

(d) William Harvey (e) Stanley Cohen

105) Who postulated the mutation theory?

(a) G. Mendel (b) Charles Darwin (c) J.B. Weismann **(d) Hugo de Vries**

106) Which one of these is not a case of artificial selection?

(a) shetland pony (b) great dane dog (c) broccoli **(d) peppered moth**

(e) Arabian race horse

107) Amphibians were dominant during

**(a) Carboniferous** (b) silurian (c) ordovician (d) cambrian (e) jurassic

108) The first evolved organisms were

(a) Chemoautotrophs **(b) Chemoheterotrophs** (c) Cyanobacteria (d) Bacteria.

109) Darwin's finches show one of the following aspects of evolution

**(a) Biogeographic evidence** (b) Industrial melanism (c) Biochemical evidence

(d) Embryological evidence

110) Evolutionary development of a species can be best studied by

- (a) DNA analysis    (b) Finding age by carbon dating  
**(c) Studing fossils of this species**    (d) All the above

111) Among the following, a structure, which is not vestigial, is

- (a) Wisdom teeth    (b) Plica semilunaris    (c) Vermiform appendix    **(d) Nails**

112) Cause of speciation is

- (a) Random mating    (b) Hybridization    **(c) Isolation**    (d) Migration

113) Sickle-cell anaemia, the best example of natural selection, is due to gene modification related to amino acid of

- (a) First  $\beta$  chain    **(b) Second  $\beta$  chain**    (c) second  $\alpha$  chain    (d) First  $\alpha$  chain

114) Which one of the following periods is largely associated with extinction of dinosaurs and the increase in flowering plants and reptiles?

- (a) Jurassic    (b) triassic    **(c) cretaceous**    (d) permian

115) Darwin judged the fitness of an individual by

- (a) ability to defend itself    (b) strategy to obtain food    **(c) number of offspring**  
(d) dominance over other individuals

116) Mass extinction at the end of mesozoic era was probably due to

- (a) continental drift    **(b) the collision of earth with large meteorites**  
(c) massive glaciations    (d) change in earth's orbit

117) Tachyglossus is a connecting link between

- (a) reptiles and birds    (b) amphibians and reptiles    (c) birds and mammals  
**(d) reptiles and mammals**

118) Darwin's theory does not include

- (a) Natural selection    (b) Survival of the fittest    **(c) Evolution through inheritance**  
(d) struggle for existence

119) Which one of the following describes correctly the homologous structures?

**(a) organs with anatomical similarities, but performing different functions.**

(b) organs with anatomical dissimilarities, but performing same function.

(c) organs that have no function now, but had important functions in ancestors.

(d) organs appearing only in embryonic stage and disappearing later in the adult.

120) An evolutionary pattern characterised by a rapid increase in the number and kinds of closely related species is called

(a) convergent evolution    (b) divergent evolution    **(c) adaptive radiation**

(d) parallel evolution

121) A common means of sympatric speciation is

(a) polyploidy    **(b) temporal segregation of breeding season**

(c) spatial segregation of mating sites    (d) imposition of geographic barrier

122) The most apparent change during the evolutionary history of Homo sapiens is traced in

(a) shortening of the jaws    **(b) remarkable increase in the brain size**

(c) loss of body hair    (d) walking upright

123) What was the most significant trend in the evolution of modern man (Homo sapiens) from his ancestors?

(a) upright posture    (b) shortening of jaws    (c) binocular vision

**(d) increasing brain capacity**

124) Sweet potato is homologous to

(a) potato    (b) colocasia    (c) ginger    **(d) turnip**

125) Evolution of different species in a given area starting from a point and spreading to other geographical areas is known as:

**(a) Adaptive radiation**    (b) Natural selection    (c) Migration    (d) Divergent evolution

126) Which one of the following options gives one correct example each of convergent evolution and divergent evolution?

(a)

**Convergent evolution**

**Divergent evolution**

**Eyes of octopus and mammals**

**Bones of forelimbs of vertebrates**

(b)

**Convergent evolution**   **Divergent evolution**

Thorns of Bougainvillea   Wings of butterflies and birds

(c)

**Convergent evolution**

**Divergent evolution**

Bones of forelimbs of vertebrates   Wings of butterfly and birds

(d)

**Convergent evolution**

**Divergent evolution**

Thorns of Bougainvillea and tendrils of Cucurbita   Eyes of Octopus and mammals

127) There is no life on moon because of absence of

(a) **Water**   (b) Oxygen   (c) Nitrogen   (d) Hydrogen

128) Which of these pairs is vestigial?

(a) **Coccyx and pinna muscles**   (b) Coccyx and premolar   (c) Facial hair in ladies

(d) Coccyx and intercostal muscles

129) According to abiogenesis life originated from

(a) **Nonliving**   (b) other planets   (c) Preexisting life   (d) spontaneously

(e) chemicals

130) Convergent evolution is illustrated by

(a) Rat and Dog   (b) Starfish and cuttle fish   (c) Bacterium and protozoan

(d) **Dogfish and whale**

131) Recapitulation theory was called the law of Biogenesis by

(a) **Haeckel**   (b) Darwin   (c) Lamarck   (d) Hugo de Vries

132) Reproductive isolation between segments of a single population is termed

(a) **sympatry**   (b) allopatry   (c) population divergence   (d) disruptive divergence

133) Which of the following is a connecting link between mammals and reptiles?

(a) Peripatus   (b) Balanoglossus   (c) **Ornithorhynchus**   (d) Archaeopteryx

134) Which one of the following was not given by Darwin's theory of evolution?

(a) struggle for existence (b) over production (c) natural selection

**(d) genetic drift**

135) Darwin's finches provide an excellent evidence in favour of evolution. The evidences come from the field of

(a) embryology (b) palaeontology **(c) biogeography** (d) anatomy

136) What was the most significant trend in the evolution of modern man (Homo sapiens) from his ancestors?

(a) Shortening of jaws (b) Binocular vision (c) Increasing cranial capacity

**(d) Upright posture**

137) The extinct human who lived 1,00,000 to 40,000 years ago, in Europe, Asia and parts of Africa, with short stature, heavy eyebrows, retreating fore heads, large jaws with heavy teeth, stocky bodies, a lumbering gait and stooped posture was

(a) Homo habilis **(b) Neanderthal human** (c) Cro-magnan human

(d) Ramapithecus

138) Miller and Urey performed an experiment to prove the origin of life. They took gases

(a) methane, ethane, ammonia, water vapour

**(b) methane, ammonia, hydrogen, water vapour**

(c) methane, ethane, hydrogen, ammonia

(d) ammonia, water vapour, butane, hydrogen

139) The origin of mammal like reptiles occurred in

(a) Triassic period **(b) Permian period** (c) Jurassic period (d) Tertiary period

140) Darwin in his 'Theory of Natural selection' did not believe in any role of which one of the following in organic evolution?

(a) Survival of the fittest (b) Struggle for existence **(c) Discontinuous variations**

(d) Parasites and predators as natural enemies

141) Which one of the following is present today but was absent about 3-5 billion years ago?

(a) Nitrogen **(b) Oxygen** (c) Hydrogen (d) Methane

142) Theory of spontaneous generation was given by

(a) Louis Pasteur (b) F. Redi **(c) Von Helmholtz** (d) Spallanzani

143) Coacervates are

- (a) Colloidal droplets    (b) Contain nucleoprotein    **(c) (a) and (b)**    (d) Protobiont  
(e) Bacteria

144) 'Use and disuse' theory was proposed by

- (a) Lamarck**    (b) Darwin    (c) Hugo de Vries    (d) Malthus

145) Haeckel's biogenetic law is

- (a) ontogeny repeats phylogeny**    (b) phylogeny repeats ontogeny  
(c) reproductive isolation    (d) every organism is produced by its parents

146) Origin of first toothed birds and gymnosperms took place during

- (a) cretaceous    (b) triassic    **(c) Jurassic**    (d) permian

147) Who proposed the theory of origin of species by natural selection?

- (a) August Weismann    (b) De vries    **(c) Charles Darwin**  
(d) Charles Darwin and Alfred Wallace

148) Which one is not a vestigial organ?

- (a) Wings of Kiwi    **(b) Flipper of seal**    (c) Coccyx in man    (d) Splint bone of horse  
(e) Pelvic girdle of python.

149) The wings of bat and bird are

- (a) Homologous but not analogous**    (b) Neither homologous nor analogous  
(c) Analogous but not homologous    (d) Vestigial    (e) Both homologous and analogous

150) According to oparin, which one of the following was not in the primitive atmosphere of the earth?

- (a) oxygen**    (b) Hydrogen    (c) Water Vapour    (d) Methane

151) Coacervates were experimentally produced by

- (a) Sidney fox and oparin**    (b) Fischer and Huxley    (c) Jacob and Monod  
(d) Urey and Miller

152) The gases used in the spark-discharge apparatus were-

- (a)  $\text{NH}_3$ ,  $\text{NH}_4$  and  $\text{O}_2$     (b)  $\text{O}_2$ ,  $\text{CO}_2$  and  $\text{NH}_3$     (c)  $\text{CO}_2$ ,  $\text{NH}_3$  and  $\text{CH}_4$   
**(d)  $\text{H}_2$ ,  $\text{CH}_4$  and  $\text{NH}_3$**

153) Biogenetic law as given by Haeckel states that

- (a) **ontogeny recapitulates phylogeny** (b) phylogeny recapitulates ontogeny  
 (c) ontogeny and phylogeny go together  
 (d) there is no relationship between phylogeny and ontogeny

154) Stanley Miller had put the Oparin-Haldane theory to test in 1953 by creating in the laboratory, the probable conditions of the primitive earth. In the experiment, simple amino acids were synthesized from which of the following mixtures as observed after 18 days?

- (a)  $H_2, O_2, N$  and  $H_2O$  (b)  $CH_4, CN, H_2$  and  $O_2$   
 (c)  $H_2, NH_3, CH_4$  and **water vapour** (d)  $NH_3, CH_4$ , and  $O_2$

155) Darwin's finches are a good example of

- (a) convergent evolution (b) industrial melanism (c) connecting link  
 (d) **adaptive radiation**

156) Match the items in Column I with those in Column II.

Column I	Column II
A. Ice-age (75000 - 10000 years before)	1. Neanderthal man.
B. 1.5 mya	2. Agriculture started
C. Brain size of 1400 cc	3. Homo erectus; they probably ate meat.
D. 10000 years before	4. Modern Homo sapiens arose
	5. Homo habilis; they probably did not eat meat.

- (a) A - 2, B-3, C - 1, D - 4 (b) A - 4, B-1, C - 3, D - 2 (c) A - 3, B-4, C - 1, D - 2  
 (d) **A - 4, B-3, C - 1, D - 2**

157) Match the organisms in Column I with the geological time scale of their appearance on the globe.

Column I	Column II
A. Jawless fish	1. 500 mya
B. Dryopithecus	2. 320 mya
C. Sea weeds	3. 350 mya

D. Invertebrates	4. 200 my a - dominated the earth
E. Reptiles	5. 15 mya
	6. 1.5 mya

**(a) A - 3, B - 5, C - 2, D - 1, E - 4** (b) A - 5, B - 3, C - 2, D - 1, E - 4

(c) A - 3, B - 5, C - 2, D - 4, E - 1 (d) A - 3, B - 2, C - 5, D - 1, E - 4

158) Appearance of antibiotic-resistant bacteria is an example of

(a) adaptive radiation (b) transduction

**(c) pre-existing variation in the population** (d) divergent evolution.

159) The bones of forelimbs of whale, bat, cheetah and man are similar in structure, because

(a) one organism has given rise to another **(b) they share a common ancestor**

(c) they perform the same function (d) they have biochemical similarities

160) Analogous organs arise due to

(a) divergent evolution (b) artificial selection (c) genetic drift

**(d) convergent evolution.**

161) Change of frequency of alleles in a population results in evolution. This statement is proposed in

(a) Darwin's theory (b) Lamarck's theory **(c) Hardy-Weinberg principle**

(d) de Vries theory.

162) Homologous organs indicate

(a) convergent evolution. **(b) divergent evolution.** (c) adaptive radiation.

(d) natural selection.

163) Evolutionary convergence is characterised by

(a) development of characteristics by random mutations.

**(b) development of similar characteristics in different groups of organisms of different ancestry.**

(c) development of dissimilar characteristics in closely related groups of organisms.

(d) development of similar characteristics in related groups of organisms.

164) A study of fossils in different sedimentary layers indicates the \_\_\_\_\_ period in which they existed.

**Geological.**

165) \_\_\_\_\_ evolution leads to homologous organs.

**Divergent.**

166) Placental mammal lemur in Australia shows resemblance to the marsupial mammal \_\_\_\_\_.

**Spotted Cuscus.**

167) Placental mammals and marsupial mammals of Australia show \_\_\_\_\_ evolution.

**Convergent.**

168) De Vries believed that single step large mutation, called \_\_\_\_\_ caused speciation.

**Saltation.**

169) \_\_\_\_\_ evolved into the first amphibians.

**Lobefins.**

170) About 65 mya, \_\_\_\_\_ suddenly disappeared from the earth.

**Dinosaurs.**

171) \_\_\_\_\_ probably lived in East African grasslands about 2 mya.

**Australopithecus.**

172) The brain capacities of Homo habilis was about \_\_\_\_\_ cc.

**650-800 cc**

173) Fossils of \_\_\_\_\_ were discovered in Java.

**Homo erectus.**

TRUE FALSE

6 x 1 = 6

174) Ontogeny repeats phogeny.

**(a) True** (b) False

175) Prehistoric cave art developed after agriculture, about 18000 years ago.

(a) True    **(b) False**

176) The skull of baby chimpanzee is more like the adult human skull than the skull of adult chimpanzee.

**(a) True**    (b) False

177) It is believed that 3-4 mya, man-like primates walked in Eastern Africa.

**(a) True**    (b) False

178) Due to continental drift, pouched mammals of Australia survived due to lack of competition.

**(a) True**    (b) False

179) Tyrannosaurus was the smallest among the dinosaurs.

(a) True    **(b) False**

1 MARKS

237 x 1 = 237

180) 'Sweet potato tubers and potato tubers are the result of convergent evolution'. Justify the statement.

**Sweet potato tubers and potato tubers are analogous structures, evolved for the same function; analogous structures result from convergent evolution.**

181) What did Louis Pasteur's experiment on 'Killed yeast' demonstrate? Name the theory that got disproved on the basis of his experiment.

**- It demonstrated that life comes only from pre-existing life. - Theory of spontaneous generation was disproved.**

182) What is the basis of origin of variations in organisms as described by Hugo de Vries?

### **Mutation**

183) Write the similarity between the wing of a butterfly and the wing of a bat. What do you infer the above with reference to evolution?

**(i) They are analogous organs, which perform similar functions.**

**(ii) Analogous organs are the result of convergent evolution.**

184) State the significance of biochemical similarities amongst diverse organisms in evolution.

**The biochemical similarities point to the same shared ancestry among diverse organisms.**

185) Comment on the similarity between the wing of a cockroach and the wing of a bird. What do you infer from the above with reference to evolution?

**(i) They are analogous organs, which perform similar functions.**

**(ii) Analogous organs are the result of convergent evolution.**

186) State the significance of Coelacanth in evolution

**Coelacanth has evolved into the first amphibians; they are fish with stout and strong fins that could move on land and go back to water.**

**They were thought to be extinct.**

187) Comment on the similarity between the flippers of dolphins and penguins, with reference to evolution.

**They are analogous organs, which perform similar functions.**

**Analogous organs are the result of convergent evolution.**

188) Are flippers of penguin and dolphin homologous or analogous? What type of evolution has brought such a similarity in them?

**They are analogous organs, which perform similar functions.**

**Analogous organs are the result of convergent evolution.**

189) How does a population become 'founders' of a new species?

**When the change in allele frequency is so different that the new sample of population becomes a different species, the original drifted population becomes founders.**

190) When does a species become founders to cause founder effect?

**When the change in allele frequency is so different that the new sample of population becomes a different species, the original drifted population becomes founders.**

191) What does Hardy-Weinberg equation  $p^2 + 2pq + q^2 = 1$ , convey?

**It indicates genetic equilibrium, i.e. the allele frequencies in a population are stable and remain constant from generation to generation.**

192) Name the scientist who disproved spontaneous generation theory.

**Louis Pasteur disproved the spontaneous generation theory.**

193) Why are the wings of a butterfly and of a bat called analogous?

**They are called analogous, as they perform similar function (flying), but are dissimilar in their basic structural plan and development.**

194) Are the thorns of Bougainvillea and tendrils of Cucurbita homologous or analogous? What type of evolution has brought such a similarity in them?

**They are homologous.**

**Divergent evolution has brought such a similarity.**

195) Mention the type of evolution that has brought the similarities as seen in potato tuber and sweet potato.

**Convergent evolution.**

196) Are the wing of a bird and the forelimb of a horse homologous or analogous? Name the type of evolution that explains the development of such structures.

**- They are homologous. - Divergent evolution has brought such a similarity.**

197) According to Hardy-Weinberg's principle, the allele frequency of a population remains constant. How do you interpret the change of frequency of alleles in a population?

**The change of frequency of alleles in a population would be interpreted as resulting in evolution.**

198) Why are lichens regarded as pollution indicators?

**Since, lichens do not grow in polluted areas, they are regarded as pollution indicators.**

199) Mention what caused evolution according to de Vries.

**According to de Vries, single-step large mutation (saltation) caused evolution/speciation.**

200) Name any two vertebrate body parts that are homologous to human forelimbs.

**Wings of birds and forelimbs of horses are homologous to human hand.**

201) What causes speciation according to Hugo de Vries?

**According to de Vries, single-step large mutation (saltation) caused evolution/speciation.**

202) Pick out the ancestral line of Angiosperms from the list given below: Conifers, Seed ferns, Cycads, Ferns.

**Seed ferns.**

203) Name the placental mammals corresponding to the Australian 'spotted cuscus' and 'Tasmanian tiger cat', which have evolved as a result of convergent evolution.

**Spotted cuscus - Lemur.**

**Tasmanian tiger cat - Bobcat.**

204) How do we compute the age of a fossil?

**The age of a fossil is calculated by radioactive (carbon) radiation.**

205) In a certain population, the frequency of three genotypes is as follows:

Genotypes	BB	Bb	bb
Frequency	22%	62%	16%

what is the likely frequency of alleles B and b?

**Frequency of allele B =  $22(BB) + 1/2 \times 62(Bb) = 22 + 31 = 53\%$**

**Frequency of allele b =  $1/2 \times 62(bB) + 16(bb) = 31 + 16 = 47\%$**

206) Among the five factors that are known to affect Hardy-Weinberg equilibrium, three factors are gene flow, genetic drift and genetic recombination. What are the other two factors?

**Mutation and Natural selection.**

207) Which type of natural selection is the industrial melanism observed in moth, Biston betularia?

**It is directional type.**

208) By what Latin name, is the first human-like being, the hominid known?

**Homo habilis is the first hominid.**

209) Who probably did not eat meat among Ramapithecus, Australopithecus and Homo habilis?

**Homo habilis probably did not eat meat.**

210) What is evolutionary biology?

**Evolutionary biology is the study of history of life forms on earth.**

211) Why is it said that when we see stars, we are apparently peeping into the past?

**The stars we today are objects whose emitted light started its journey millions of years before and from trillions of kilometers away and reaching our eyes now; so when we see stars, we are apparently peeping into the past.**

212) Name the unique event in the history of universe.

**The origin of life is considered the unique event in the history of universe .**

213) When was the earth supposed to have been formed?

**Earth was supposed to have been formed 4.5 billion years before.**

214) Name the theory that describes the formation of universe.

**Big Bang theory.**

215) Who showed that life comes only from pre-existing life?

**Louis Pasteur.**

216) Why was the theory of spontaneous generation dismissed?

**Spontaneous generation theory was dismissed because it did not say how the first life form came on earth.**

217) Who disproved the theory of spontaneous generation?

**Louis Pasteur disproved the theory of spontaneous generation.**

218) Who proposed the theory of origin of Life?

**Oparin and Haldane.**

219) Who provided experimental support for Oparin-Haldane hypothesis?

**S.L. Miller.**

220) In which form/forms did miller supply energy in their experiment?

- (i) Through electric discharge, and**
- (ii) By heating the water chamber.**

221) When did the first cellular form of life appear?

**The first cellular forms appeared 2000 million years ago.**

222) What is 'fitness' according to Darwin?

**The fitness, according to Darwin, refers ultimately to reproductive fitness.**

223) Name the scientist who also came to similar conclusion as Darwin. Where did he work?

**Alfred Wallace. He worked in Malay Archipelago.**

224) State the biogenetic law.

**Ontogeny recapitulates phylogeny.**

225) Define biogeography.

**Biogeography refers to the study of distribution of living organisms in different parts of the earth.**

226) Name the island where Darwin made most of his observations.

**Galapagos.**

227) What are Darwin's finches?

**Darwin's finches are the small black birds found by Darwin in Galapagos islands.**

228) Mention the two key concepts of Darwinism.

**(i) Branching descent, and**

**(ii) Natural selection are the two key concepts of Darwinism.**

229) Name the first group of organisms that invaded land.

**Bryophytes invaded the land first.**

230) Name the ancestor of Bryophytes.

**Chlorophyta (Green algae).**

231) Name the period in the geological history when lycopods flourished.

**Jurassic period.**

232) Name the common ancestor of cycads and dicots.

**Seed Ferns.**

233) What is saltation in evolution?

**Saltation refers to single-step large mutation that results in speciation.**

234) What is meant by gene pool?

**The sum total of all the genes (and their alleles) pooled by all the members of a population, is called gene pool.**

235) What is meant by genetic equilibrium?

**When allele frequencies in a population are stable, the gene pool remains a constant and that is called genetic equilibrium.**

236) What is evolution according to Hardy-Weinberg?

**Disturbance in genetic equilibrium, i.e. change of frequency of alleles in a population, would be considered as evolutionary change.**

237) What is founder effect?

**Founder effect refers to the change in the allele frequency of an original drifted population that becomes a different species and the founders.**

238) Mention any one major source of variation in a sexually reproduced offspring and an asexually reproducing population respectively.

**Crossing over and recombination in meiosis during gamete formation.**

239) Name the type of fish that was caught in South America in 1938, that is considered as ancestor of modern amphibians.

**Coelacanth, a lobefin.**

240) What technical term is given to the fish-like reptiles?

**Ichthyosaurs**

241) What did the first mammals look like?

**The first mammals were like shrews.**

242) Name the forerunner of hominid evolution.

**Ramapithecus.**

243) Give the scientific name of the first human-like ancestor.

**Homo habilis.**

244) Write the scientific name of the species that succeeds Homo habilis in hominid evolution.

**Homo erectus.**

245) Mention the brain capacities of

- (a) Homo habilis, and
- (b) Neanderthal man.

**(a) 650-800 cc**

**(b) 1400 cc**

246) When (how many years before) were the following developed?

- (a) Cave art, and
- (b) Agriculture.

**(a) 18000 years ago**

**(b) 10000 years ago.**

247) What are the characteristics of life forms that had been fossilised?

- 1. Possession of hard parts like bones, teeth, shell, venation of leaves ect.,**
- 2. Burial in a medium where no oxidation of the material occurs.**

248) Did aquatic life forms got fossilized? If yes, where do we come across such fossils?

**Yes, the aquatic life has more chances of being fossilised as their dead bodies are buried in the sedimentary rocks. We come across such fossils when the sedimentary rocks are exposed due to drastic changes in the crust of the earth.**

249) How do we compute the age of a living tree?

**By determining the number of annual rings in the lower part of its trunk, called dendrochronology.**

250) Give an example for convergent evolution and identify the features towards which they are converging.

**Sweet potato and potato tuber show convergent evolution because sweet potato is a fleshy adventitious root while potato tuber is an under-ground stem. They are both are fleshy due to storage of food. They are analogous organs and show phenomenon of analogy.**

251) What is more important precondition for adaptive radiation?

- (i) Occurs in same geographical area.**
- (ii) Show by different members of same ancestor.**
- (iii) Radiated to different habitats and developed different habits.**

252) How de we compute the age of a rock?

**By determining the quantity of uranium and lead in the rocks.**

253) When we talk of functional macro-molecules e.g. protein as enzyme, hormones, receptor, antibodies, ect., towards what are they evolving?

**They are evolving towards different functions among diverse organism and evolving into complex organism.**

254) Who among the Dryopithecus and Ramapithecus was more man-like?

**Ramapithecus.**

255) Name the following:

- (a) Who conceived the idea of chemosynthetic hypothesis of origin of life on earth?
- (b) Who proved that spontaneous generation does not occur?
- (c) Who experimentally proved that life develops from pre-existing life only?
- (d) Who gave the theory of organic evolution?

- (a) Oparin and Haldane**
- (b) Francois Redi, Spallanzani and Louis Pasteur**
- (c) Pasteur**
- (d) Charles Darwin.**

256) When did life appear on earth?

**Life originated sometimes 3600 million years ago.**

257) Give another name for origin of life.

**Biopoiesis.**

258) Who finally proved that life cannot originate from pre-existing life?

**Louis Pasteur.**

259) Which was the earliest form of life that came on earth?

**Organism resembling cyanobacteria.**

260) What was the type of atmosphere in the early stages?

**Reducing atmosphere and gaseous.**

261) Justify that life began in the sea.

**Life originated in sea, the body fluid of all animals contains salts found in the sea water.**

262) Name the gas absent in primitive atmosphere.

**Oxygen in gaseous form was absent in the primitive atmosphere.**

263) What product was formed in the Miller's experiment in the direction of origin of life on earth?

**Amino acids such as glycine,  $\alpha$ -alanine, aspartic acid and glutamic acids.**

264) Arrange the following substances in a proper sequence with regard to the formation of chemical constituents at the time of origin of life: Sugar, methane, nucleic acid and amino acid.

**Methane-sugar-amino acid-nucleic acid.**

265) Whose theory formed the basis of chemical origin of life?

**Oparin and Haldane.**

266) What are microspheres?

**The microspheres are formed when mixtures of artificially produced compounds are mixed with cold water.**

267) Where will you find the most ancient and recent fossil?

**The most ancient fossils will occur in the older rocks; whereas most recent will occur in the youngest rocks.**

268) What is Hardy-Weinberg principle?

**According to Hardy-Weinberg law, under certain conditions of stability allelic frequencies remain constant from generation to generation in sexually reproducing organisms.  $p^2+q^2+2pq=1$**

269) What is the cranial capacity of modern man?

**1200-1600 cm<sup>3</sup>**

270) Which chromosome in humans and chimpanzees shows an identical banding pattern?

**Chromosome numbers three and six show similar banding pattern in human and chimpanzee.**

271) Starting with the oldest form rearrange the following genera species according to their sequence of appearance on earth:

Homo erectus, Homo sapiens, Ramapithecus, Homo habilis, Australopithecus.

**Ramapithecus, Australopithecus, Homo habilis, Homo erectus, Homo sapiens.**

272) State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks/during industrialization period in England).

**Soot evolved from coal-based industries deposited on tree bark of oak plants and darkened it called Industrial melanism. Dark coloured moth (Biston carbonaria) had more chances of survival so increased in number.**

273) Which one of the living apes diverged first from the main line of hominid evolution and which one diverged last?

**Gibbon is most primitive of the apes and diverged first from the main line of hominoid.**

**Gorilla diverged last in the history of evolution of ape.**

274) According to de-Vries what is saltation?

**Saltation is mutation according to de-Vries-Mutations are inheritable and the raw material of evolution.**

275) Name any two primitive Gymnosperms.

### **Cycads and Ginkgo**

276) Give an example of homologous organs in insects.

### **Mouth parts and legs of insects.**

277) Consider a thorn in Bougainvillea and a tendril in Cucurbita. Are these two organs homologous or analogous? Give reason.

**Thorn in Bougainvillea and tendril in Cucurbita are homologous organs as both are stem modifications. They show divergent evolution.**

278) What must be present in any population before selection, either artificial or natural that can bring about changes?

### **Variations must be present.**

279) What are the two most important phenomena in nature which form the basis of Darwinism?

### **Isolation and adaptation**

280) What are fossils?

#### **Answer : Fossils:**

1. The remnants or impressions of living organisms from the remote past may be regarded as fossils.
2. Fossil formation involves the burial of dead organism. Layer after layer of sediment is laid above the dead organism. It is only on this account that the oldest fossils are found in the deepest layers of the earth's surface while the fossils of recent origin are found in the upper layers.
3. **Significance:** Thus by examining the various layers of earth from the deepest to the most superficial strata for fossil record, the story of life in correct historical sequence can be known.

281) What are meteorites?

### **Fragments of rock falling from space onto the earth.**

282) Give the age of the earliest prokaryote.

### **33 billion years.**

283) Where did life appear first?

### **Sea water.**

284) Is life still originating?

**No.**

285) Is the scheme of origin of life given by Oparin and Haldane final?

**No**

286) Name the scientist who experimentally confirmed the Oparin-Haldane theory of the origin of life.

**Stanley Miller**

287) Name the stage that followed coacervates in the origin of life.

**Protocells or eobionts.**

288) Were the first-formed organisms autotrophic or heterotrophic?

**Heterotrophic.**

289) In what form/forms had Urey and Miller supplied energy in their experiment?

**Electric sparks and heat from electric heater.**

290) Was oxygen present in free state in primitive earth's atmosphere?

**No**

291) Who was the first scientist to object 'theory of abiogenesis'?

**Francisco Redi.**

292) What is the probable period of origin of cyanobacteria?

**About 3.3 to 3.5 billion years ago.**

293) Name the possible sources of energy in most accept theory of origin of life.

**UV radiations, electric energy produced during lightening, heat of the earth.**

294) What does theory of special creation state?

**All kinds of living organisms were formed by some supernatural power called God or Creator.**

295) What was sealed in the spark chamber in famous Miller and Urey simulation experiment?

**Mixture of methane (CH<sub>4</sub>), Ammonia (NH<sub>3</sub>), Hydrogen (H<sub>2</sub>) gas and water (H<sub>2</sub>O) vapours.**

296) Who obtained protenoid microspheres by heating a mixture of dry amino acids to 130 - 180°C and later cooling them in water?

**Sydney Fox (1950).**

297) What do you mean by Panspermia?

**Alternate name of Cosmozoic or Interplanetary theory.**

298) Give a 3-word definition of "organic evolution".

**Descent with modification.**

299) Cite one example of homologous organs in plants.

**Thorns of Bougainvillea and tendrils of passiflora.**

300) Give two examples of connecting links.

**Lungfish, egg-laying mammals.**

301) Name two vestigial organs of human body.

**Nictitating membrane, vermiform appendix.**

302) Define recapitulation theory in 3 words.

**Ontogeny repeats phylogeny.**

303) Mention one temporary embryonic structure of no use.

**Teeth in bird embryo.**

304) Name three main kinds of rocks.

**Igneous, sedimentary, metamorphic.**

305) Which organs of man are homologous to the wings of birds?

**Arms (forelimbs).**

306) Cite one example of dinosaurs.

**Brontosaurus.**

307) In which era the fossils are scanty.

**Proterozoic.**

308) What is Archaeopteryx? What is its significance in evolution?

**A fossil bird. It shows how the reptiles could evolve into birds.**

309) Who proposed the biogenetic theory "ontogeny repeats phylogeny"?

**Von Baer.**

310) Cite two examples of analogous organs and two of atavistic structures.

**Insect wing and bird wing, leaves of plants and cladodes of Ruscus are analogous organs, tail in human body and additional mammae in some persons are atavistic structures.**

311) Which period is called the 'age of reptiles'?

**Mesozoic.**

312) Mention the immediate ancestors of birds and mammals.

**Reptiles.**

313) Name three recent eras of geological time.

**Paleozoic, Mesozoic and Cenozoic**

314) Name the era in the geological time scale when life had not yet originated on earth.

**Early Archaeozoic.**

315) Mention any species which came into existence in the recent past.

**Melanic moth, Biston carbonaria.**

316) In which era of geological time scale mammals dominated the scene?

**Miocene epoch of Cenozoic era.**

317) Name a living fossil.

**Latimeria - the coelacanth.**

318) Give an example of missing link

**Archaeopteryx.**

319) Name the theory of evolution given by Lamarck.

**Inheritance of acquired characters.**

320) Evolution is a discontinuous process. Is it correct?

**Yes.**

321) Give the three key factors of the modern concept of evolution.

**Genetic variation, natural selection and isolation.**

322) In which areas does the dark melanic species of the peppered moth abound?

**Industrial regions.**

323) What is the cause of sickle-cell anemia?

**Gene mutation which changes composition of haemoglobin and form of RBCs.**

324) In what respect did Darwin agree with Lamarck?

**Inheritance of acquired characters.**

325) Cite one example of natural mutation producing a new species.

**Ancon (short - legged) sheep.**

326) What are sympatric species?

**Which arise through isolation other than geographical isolation.**

327) How do genes mutate?

**By addition, deletion and substitution of a base in DNA.**

328) List 3 mechanism by which variant genotype can be produced in nature.

**Mutation in genes and hybridisation, mutation in genes and chromosomes.**

329) Which source of variations denied to the asexually reproducing organisms and self-fertilising hermaphrodites? Which phenomenon needs to occur to bring about variation in such forms?

**Recombination of genes and hybridisation, mutation in genes and chromosomes.**

330) What is the significance of the Lederberg experiment?

**It demonstrates that preexisting gene mutation is the basis of adaptation.**

331) Name any two breeds of wild rock pigeon that have been developed through artificial selection.

**Pouter, fan tail and jacobin.**

332) Should man be regarded a "special creation" or "just another animal"?

**Just another animal.**

333) Which is the common ancestor of old world monkeys, apes and humans?

**Parapithecus**

334) Name the ancestors of primates.

**Tree shrews.**

335) Name the common ancestor of great apes and man.

**Dryopithecus.**

336) "Man descended from monkeys". Do you agree?

**No**

337) Which is the earliest fossil of prehistoric man?

**Ramapithecus and Sivapithecus.**

338) Name the apes which are most primitive.

**Gibbons.**

339) What is the cranial capacity of man?

**1300-1600 cm<sup>3</sup>.**

340) Where have the fossils of Sivapithecus found?

**In the Shivalik hills of India.**

341) Name the extinct representative of modern man.

**Cro-Magnon man.**

342) Which place in India is famous for human fossils?

**Shivalik foothills of the Himalayas.**

343) Which is opposable in man, pollex or hallux?

**pollex.**

344) Name the primate family in which the humans have been placed.

**Hominidae**

345) What is the diploid number of chromosomes in the great apes and in the humans?

**48, 46.**

346) Who is a palaeoanthropologist?

**Person that studies human fossils.**

347) Write about the theory of spontaneous generation.

**It stated that life originated repeatedly from non-living materials in a spontaneous manner.**

348) Name the naturalist who had also come to similar conclusion around the same time what Darwin worked out?

**Alfred Russel Wallace.**

349) Atmosphere of the primitive earth was highly.....while that of present earth is highly.....

**reducing, oxidizing.**

350) State the significance of study of fossils in evolution.

**Fossils help us to know the geological period in which the organisms were present to understand the process of the evolution.**

351) What is the way to compute the age of a fossil?

**Radiocarbon dating is one of the way to compute the age of a fossil.**

352) Explain the meaning of 'survival of the fittest'.

**The ability to survive and to reproduce in their respective environment is termed as survival of the fittest.**

353) Identify the examples of convergent evolution from the following.

- (i) Flippers of penguins and dolphins
- (ii) Eyes of Octopus and mammals.
- (iii) Vertebrate's brain.

**(i) Flippers of penguins and dolphins.**

**(ii) Eyes of Octopus and mammals.**

354) Why are analogous structures a result of convergent evolution ?

**When organisms of different geographical location come into an area, i.e. they converge to the restricted habitat, they develop adaptations to that location and develop analogous structures.**

355) State the reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialisation period in England.

**During post-industrialisation period, the tree trunks got dark because of industrial smoke and soot, so the dark coloured moths were able to hide without any risk of predation, survived and increased in population. White winged moths did not survive due to predators.**

356) Coelacanth that was caught in 1938 in south Africa, was very significant in the evolutionary history of vertebrates. Why?

**Coelacanth, a fish was caught in 1938 in south Africa, which was thought to be extinct. These were lobe-fins, fish-like animals with stout and strong fins, that lived both in water as well as on land. Their discovery was significant as they proved that amphibians have evolved from fish-like organisms.**

357) State the significance of biochemical similarities among diverse organisms in evolution.

**Similarities in biochemical such as DNA help in deriving the line of evolution. Organisms with more similar DNA sequence are considered close relatives or have evolved from the same ancestor.**

358) What is 'Saltation' according to De Vries?

**According to De Vries saltation is a single step large mutation arising suddenly in a population causing evolution.**

359) What are the end products of the experiment of Miller?

**Amino acids.**

360) Write the probable differences in eating habits of Homo habilis and Homo erectus.

**Homo habilis did not eat meat vegetarian while Homo erectus was probably meat eaters.**

361) Write hypothetical proposals put forth by Oparin & Haldane.

**The hypothetical proposals given by Oparin & Haldane are :**

**(i) Origin of life has taken place spontaneously from pre-existing non living organic molecules.**

**(ii) Chemical evolution of life i.e. formation of life was preceded by chemical evolution**

362) Name the type of evolution that has resulted in the development of structures like wings of butterfly and bird. What are such structures called.

**(i) Convergent evolution**

**(ii) Such structures are called analogous structures.**

363) Write the basis of origin of variations in organisms as described by Hugo de Vries

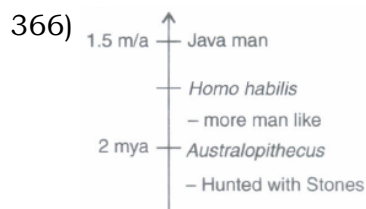
**Saltations (Mutation), large differences arising out all of a sudden in a population.**

364) Write the term used for resemblance of varieties of placental mammals to corresponding marsupials in Australia.

**Adaptive radiation.**

365) If the frequency of one allele is 'p' and for another, it is 'q' for one gene, what will be the formula to calculate allele frequency in future generations according to Hardy-Weinberggenetice equilibrium?

**The formula to calculate allele frequency is :  $(p+q)^2 = p^2 + 2pq + q^2 = 1$**



Study the ladder of human evolution given above and answer the following questions.

(a) Where did Australopithecus evolve?

(b) Write scientific name of Java man.

**(a) East Africa.**

**(b) Homo Erectus.**

367) Who was the direct ancestor of living modern man.

**Cro-Magnon,**

368) Rearrange the following statements to explain the formation of atmosphere on earth

i) The lighter hydrogen gas escaped from the surface while oxygen combined with methane, ammonia etc to form water and carbon dioxide etc.

ii) Earth cooled and water vapour fell as rain

iii) Water vapour, methane, ammonia and carbon dioxide were released from molten mass.

iv) UV rays from the sun broke up water into hydrogen and oxygen.

**iii) Water vapour , methane, ammonia and carbondioxide were released from molten mass.**

**iv) UV rays from the sun broke up water into hydrogen and oxygen.**

**i) The lighter hydrogen gas escaped from the surface while oxygen combined with methane, ammonia etc to form water and carbondioxide etc.**

**ii) Earth cooled and water vapour fell as rain**

369) Name the theory of origin based on the following statement;

i) The supernatural being created the earth, light, plants, animals

ii) Unit of life called spores transferred to different planets including earth.

iii) Life arose from decaying matter like straw.

iv) First form of life could have come from pre-existing non-living organic molecules.

v) The first form of life arose slowly from non-living molecules involving evolutionary forces.

**(i) Theory of special creation**

**(ii) Theory of Panspermia.**

**(iii) Theory of spontaneous Generation**

**(iv) Oparin & Haldane theory of biochemical creation or chemical Evolution.**

**(v) Biogenesis**

370) Stanley Miller & Urey experimentally proved the chemical evolution of life by creating condition similar to the primitive atmosphere, in the laboratory. Name the gases filled by them in the flask .In what form was the energy supplied for the chemical reaction to occur? For how long the experiments run continuously?

**(i) CH<sub>4</sub> , H<sub>2</sub>, NH<sub>3</sub> & water vapours at 800°C.**

**(ii) Electric discharge in closed flask containing gases (i.e. CH<sub>4</sub> , H<sub>2</sub>, NH<sub>3</sub> & water vapours)**

**(iii) Seven days.**

371) Charles Darwin during a Sea voyage round the world in a sail ship (H.M.S Beagle), concluded that there has been gradual evolution of life forms . What is his theory practically known as? Write the main points of his theory . Name a scientist who arrived to similar conclusion like that of Charles Darwin?

**i) Theory of Natural Selection**

**ii) Main points of the theory i.e. built in variation in characters, over reproduction, struggle for existence, survival of the fittest through natural selection as a mechanism of evolution.**

**iii) Alfred Wallace, a Naturalist.**

372) What is indicated by a cross section of earth's crust? Name the evolutionary evidence in which different aged rock sediments containing fossil of life form are examined?

**i) Arrangement of sediments as layers one over the other during the long history of earth.**

**ii) Pale-ontological evidence**

373) Whales, bats, cheetah & humans shares similarities in the pattern of bones of forelimbs what do we call these structures. How these structures are pointing towards divergent

evolution? Give an example from plants which represent the same pattern?

**Homologous organs. Same structures developed along different directions due to Adaptations to different needs. Thorns of Bougainvillea and tendril of Cucurbita.**

374) The structures which are not anatomically similar but are performing similar function are called analogous structure. Give any two example of analogy.

Why analogous structure are said to be a result of convergent evolution?

**1) Sweet potato (root modification) and potato(stem modification)-both for storage of food**

**2) Eye of the octopus & of mammals**

**3) Flippers of penguin and dolphins**

**They are not anatomically dissimilar structures but are similar functions**

375) Evolution is the stochastic process based on chance events in nature & chance mutation in the organism. Explain it with the help of a suitable example (industrial melanism). State any other example from every day experience.

**Details about the decrease in number of white winged moths due to industrialization and increase in no. of dark winged or melanised moths. Excess use of herbicides, pesticides etc. has resulted in selection of resistant varieties in a much lesser time scale.**

376) Why small black birds later called Darwin Finches found in Galapagos Islands amazed Darwin. Which evolutionary phenomenon is represented by Darwin finches. Give any other example of this phenomenon. When is this phenomenon indicative of convergent evolution?

**From the original seed eating variety, many other forms with altered beaks arose, enabling Them to become insectivorous species & vegetarian finches.**

**Adaptive radiation.**

**Australian marsupials**

**More than one adaptive radiation appears to have occurred in an isolated geographical area (representing a habitat).**

377) Is evolution a process or the result of a process? Name the two key concepts of Darwinian Theory of evolution.

**When we describe the story of this world, evolution is described as a process. If we describe the story of life on earth, we treat evolution as a consequence of a process called natural selection. Hence till the day it is not clear.**

378) "Giraffes who in an attempt to forage leave on tall trees had to adopt by elongation of their necks." Make use of this statement to enumerate the main points of Lamarck 's theory and Darwin's theory of Natural selection.

**In order to eat leaves of tall trees, Giraffe had to adapt by stretching (elongation) of their neck i.e. evolution is driven by use & disuse of organs (Lamarckism) main points of theory to be incorporated.**

**Variant Giraffes with an ability to elongate the neck were already there in the crowd of giraffes & linking of it to explain main points of Darwin's theory of natural selection.**

379) "Allele frequencies in a population are stable and are constant from generation to generations". Who proposed this principle. State the factors that are known to affect it. What do you understand by founder effect. How these five factors mentioned can cause a change in a frequency of alleles of a population?

**Hardy –Weinberg principle.**

**Gene migration, genetic drift, mutation, genetic recombination & natural selection.**

**Definitions of founder effect.**

**Variation due to mutation or recombination during gametogenesis or due to gene flow or genetic drift results in changed frequency of genes & alleles in future generation. Coupled to enhanced reproductive success, natural selection makes it look like different population.**

380) Depending upon the trait favoured natural selection can bring about three different effects. Depict the effects with the help of diagram.

**Diagrammatic representation of stabilizing, directional and disruption factors.**

381) Complete the following statement by filling blanks 1 to 5.

- i) The first circular form of life → multi cellular organisms → (1) around 500 million years ago → jawless fish around 350 million years ago
- ii) (2) were the ancestors of the modern day frogs and salamanders
- iii) Land reptiles i.e. (3) suddenly disappeared from the earth about 65 million years ago. This called (4).
- iv) Some of the land reptiles moved back into water to evolve into (5).

**(i) Invertebrates**

**(ii) Coelacanth or lobefins**

**(iii) Dinosaurs**

**(iv) Mass extinction**

**(v) Ichthyosaurs.**

382) Rearrange the following to depict the correct sequence of the evolutionary record of man. Homo habilis, Ramapithecus, Hominid, Australopithecus, Homo erectus. Differentiate between Homo habilis and Homo erectus.

**Ramapithecus, Australopithecus, Homo habilis, Homo erectus, Homo sapiens.**

**Brain capacity of Homo habilis was between 650-800cc, whereas brain capacity of Homo erectus were 900 cc. Homo habilis did not eat meat whereas Homo erectus ate meat.**

383) Classify the following as examples of homology and analogy:

- i) Hearts of fish and crocodile.

- ii) Eyes of octopus and mammals.
- iii) Thorns of bougainvillea and spines of Opuntia.
- iv) Thorns of bougainvillea and tendrils of cucurbits

**(i) Homologous organs.**

**(ii) Analogous organs.**

**(iii) Analogous organs.**

**(iv) Homologous organs.**

384) What is Big Bang theory?

**Big Bang theory states that our earth originated as a result of cataclysmic evolution.**

385) Theory of special creation was promoted by which scientist?

**Lazzaro Spallanzani.**

386) The first cellular life form originated when and where?

**2000 million years ago, in aquatic environment.**

387) State two postulates of Oparin and Haldane's theory with reference to the origin of life.

**(i) The first form of life originated from pre-existing non-organic molecules like RNA, proteins etc.**

**(ii) Formation of life was preceded by chemical evolution that resulted in the formation of diverse organic molecules from inorganic constituents.**

388) Complete the statement given below by filling the blank.

\_\_\_\_\_ is considered as a connecting link between the reptiles and birds.

**Archaeopteryx.**

389) Apart from homologous and analogous organs, which other organs can be used as evidences for organic evolution?

**Vestigial organs, e.g. tail bone in human babies.**

390) What role does an individual organism play as per Darwin's theory of natural selection ?

**According to Darwin, the organisms which are better fit or adapt well survive in nature.**

391) What is 'fitness of an individual' according to Darwin?

**According to Darwin, fitness of an individual is its ability to reproduce successfully and leave a large number of progenies under a particular set of selection pressures.**

392) According to Hugo de Vries what is saltation?

**According to Hugo de Vries mutation that causes speciation is saltation.**

393) Define gene migration.

**The process of addition of new genes to new population and removal from old population resulting in change of frequency.**

394) How many years back were the following developed in human evolution?

(i) Cave art (ii) Agriculture

**i) Cave art : 18000 years ago**

**(ii) Agriculture: 10000 years ago**

395) Identify the period which is called age of reptiles.

**Jurassic period.**

396) What was the unique event in the history of universe?

**Origin of life is considered a unique event in history of universe.**

397) The theory of spontaneous generation was dismissed by whom and why?

**Louis Pasteur rejected the theory of spontaneous generation and stated that life originates from pre-existing life.**

398) When did bryophytes appeared on the earth?

**Bryophytes were the first plant to be appeared on earth.**

399) Hugo de Vries gave the mutation theory. Name the plant he worked on.

**Primrose plant (Oenothera lamarckiana).**

400) How can you say lobefins were ancestors of evolution?

**Lobefins were ancestors of evolution as their discovery evolved amphibians and fish-like organisms.**

401) Write down the consequence of absence of genetic variations among individual of a population.

**There will be no organic evolution will occur in such a population.**

402) The 'origin of species' was given by which scientist?

**Charles Darwin**

403) What did the first mammal look like.

**First mammal looked like shrew.**

404) Mention the conditions on earth that favoured origin of life.

**The conditions of primitive earth that favoured origin of life are:**

- (i) reducing atmosphere,**
- (ii) very high temperature and**
- (iii) volcanic storms.**

405) Name any two extinct forms of life.

**Dinosaurs, dodo, quagga**

406) When did the jawless fish evolve?

**Jawless fish evolved around 350 mya.**

407) When was the earth supposed to have been formed and when did life appear on the earth?

- (i) Earth was supposed to have been formed 4.5 billion years before.**
- (ii) Life appeared about four billion years ago.**

408) What was the idea of early Greek thinkers about origin of life?

**According to this theory (of early Greek philosophers) it was believed that units called 'Spores' or 'pansperms' came on the earth along with meteorites and they must have evolved into the various life forms.**

409) What is Theory of Panspermia?

**According to this theory (of early Greek philosophers) it was believed that units called 'Spores' or 'pansperms' came on the earth along with meteorites and they must have evolved into the various life forms.**

410) State the two principal outcomes of the experiments conducted by Louis Pasteur on origin of life.

- (i) It demonstrated that life comes only from preexisting life.**
- (ii) Theory of spontaneous generation was disproved.**

411) How did Charles Darwin express 'fitness'?

**The fitness, according to Darwin, refers ultimately to reproductive fitness.**

412) Name two animals that have evolved along with Tasmanian wolf in the Australian continent.

**Sugar glider/ Bandicoot / Koala / Numbat/ Wombat / Kangaroo / Marsupial rat / Marsupial mole.**

413) What is saltation according to De-Vries?

**Saltation refers to single-step large mutation that results in speciation.**

414) Coelacanth was caught in South Africa. State the significance of discovery of Coelacanth in the evolutionary history of vertebrates.

**(i) Coelacanth has evolved into the first amphibians; they are fish with stout and strong fins that could move on land and go back to water.**

**(ii) They were thought to be extinct.**

415) Write the names of the following:

(a) A 15 mya primate that was ape-like.

(b) A 2 mya primate that lived in East African grasslands.

**(a) Dryopithecus**

**(b) Australopithecus**

416) Rearrange the human activities mentioned below as per the order in which they developed after the modern Homo sapiens came into existence during ice age:

(i) Human settlement

(ii) Prehistoric cave art

(iii) Agriculture.

**Prehistoric cave art → Agriculture → Human settlement**

FIND ODD ONE

4 x 1 = 4

417) Carboniferous, Triassic, Devonian, Permian

**Answer : Triassic.**

418) Bobcat, Wolf, Ant eater, Spotted cuscus.

**Answer : Spotted cuscus.**

419) Human hands, Wings of butterfly, Wings of bat, Wings of birds.

**Answer : Wings of butterfly**

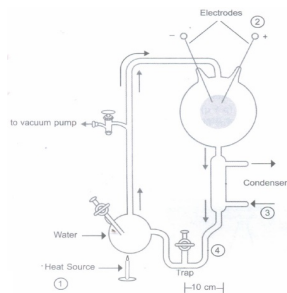
420) Lamarckism, Darwinism, Branching descent, Natural selection.

**Answer : Lamarckism.**

CASE STUDY

10 x 4 = 40

421)

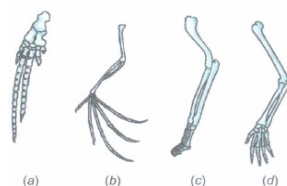


- State the hypothesis which S.L. Miller tried to prove in the laboratory with the help of the set up given above.
- Name the organic compound observed by him in the liquid water after running the above experiment.
- A scientist simulated a similar set up and added  $\text{CH}_4$ ,  $\text{NH}_3$  and water vapour at  $800^\circ\text{C}$ . Which important component is missing in his experiment?

**Answer :** (a) S.L. Miller tried to prove the hypothesis of Oparin and Haldane; it is as follows:

- The first form of life could have come from the pre-existing non-living organic molecules like RNA, proteins, etc.
  - Formation of life was preceded by chemical evolution that resulted in the formation of diverse organic molecules from inorganic constituents.
- (b) Amino acids.
- (c) Hydrogen is missing.

422)



The forelimbs of four vertebrates are shown in the diagram shown above.

- What type of evolution is exhibited by the similarity among these organs in those organisms?
- What are such organs known as?
- What do they indicate?

**Answer :** (a) Divergent evolution.

(b) Homologous organs.

(c) Homology indicates common ancestry.

423) In 1950s, there were hardly any mosquitoes in Delhi. The use of the pesticide, DDT on standing water killed their larvae. But, now there are mosquitoes because they have evolved DDT-resistance through the interaction of mutation and Natural selection. State in a sequence, how that could have happened.

**Answer :** (i) There were some larvae with a mutated gene that conferred resistance to DDT.

(ii) The DDT-resistant larvae survived while the others died.

(iii) The DDT-resistant larvae reached adulthood and reproduced in large numbers.

(iv) The progeny also consisted mostly of DDT-resistant larvae.

(v) Natural selection operating over a number of generations, favoured the DDT-resistant mosquitoes to reproduce in large numbers.

(vi) Hence, today there is a large number of mosquitoes that are resistant to DDT.

424) When the reptiles came down, mammals took over the earth. There were mammals in South America, which resembled some of the modern day mammals. But due to continental drift, they disappeared whereas the pouched mammals of Australia flourished and evolved into the various forms of pouched mammals that we see today.

(a) Mention two characteristic features that were the reasons for the successful existence of mammals on earth.

(b) Why did the continental drift affect the mammals of South America and Australia, differently.

**Answer :** (a) (i) Most of the mammals were viviparous and protected their unborn young ones inside the mother's body.

(ii) With increased brain size, they became intelligent in sensing and avoiding danger.

(b) (i) Due to continental drift, when South America joined North America, the South American mammals were overridden by those of North America.

(ii) But Australia became separated and due to lack of competition from any other mammal, the pouched mammals flourished and evolved.

425) According to Hardy-Weinberg principle, the allele frequencies in a population are stable and remain constant through generations. When the frequency differs from the expected values, the difference indicates the extent (direction) of evolutionary change. Disturbance in the genetic equilibrium or Hardy-Weinberg equilibrium in a population can be interpreted as resulting in evolution.

(a) Write the algebraic equation representing Hardy-Weinberg equilibrium.

(b) List the five factors that affect the genetic equilibrium.

**Answer :** (a)  $(p + q)^2$  or  $p^2 + 2pq + q^2 = I$ .

(b) The factors include:

(i) Gene migration/gene flow

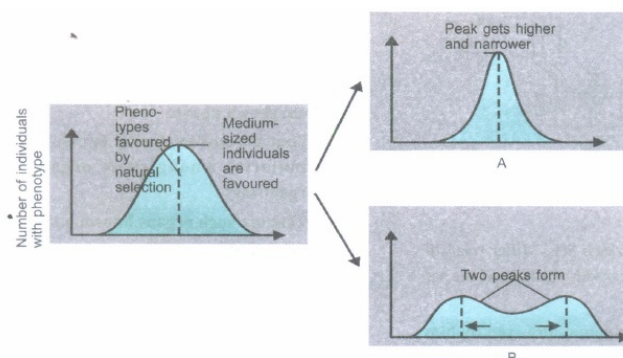
(ii) Genetic drift

(iii) Mutation

(iv) Genetic recombination

(v) Natural selection .

426)



Identify and describe the type of Natural selection operating in A and B, respectively.

**Answer :** A: Stabilising selection.

(i) In this type of Natural selection, more individuals acquire mean character value, i.e., medium sized individuals are favoured.

B: Disruptive selection.

(i) In this type of Natural selection, more individuals acquire peripheral character value at both ends of the distribution curve.

427) Fill in the blanks in the following statements, with the time period [as million years ago (mya)] of evolution of various life forms on the earth.

(a) The first non-cellular forms of life, i.e., giant organic molecules like RNA, proteins, etc. could have originated \_\_\_\_\_.

(b) About \_\_\_\_\_ the first cellular forms of life appeared on the earth; slowly single-celled forms became multicellular forms.

(c) By the time of \_\_\_\_\_ invertebrates were formed.

(d) Jawless fish probably evolved around \_\_\_\_\_.

(e) Sea weeds and a few plant species existed probably around \_\_\_\_\_ ; the first organisms that invaded land were plants.

(f) About \_\_\_\_\_ fish with stout and strong fins that could move on land and go back to water were present; they were called lobefins.

**Answer :** (a) 3000 mya (b) 2000 mya

(c) 500 mya (d) 350 mya

(e) 320 mya (f) 350 mya

428) Read the passage and answer the questions that follow:

(i) Fish with stout and strong fins existed about 350 mya; they could move on land and go back into water.

(ii) Reptiles dominated the earth for about 200 million years.

(iii) Some land reptiles went back into water and evolved into fish-like reptiles.

(iv) The land reptiles of that period were dinosaurs; they disappeared suddenly from the earth.

(a) Name the fish that could move on land and go back into water. What did they evolve into?

- (b) Give an example of the fish-like reptiles. Mention the time period when they were evolved.  
 (c) Name the largest of the dinosaurs. When did the dinosaurs suddenly disappear?

**Answer :** (a) (i) They were called lobe-fins.

(ii) They evolved into amphibians.

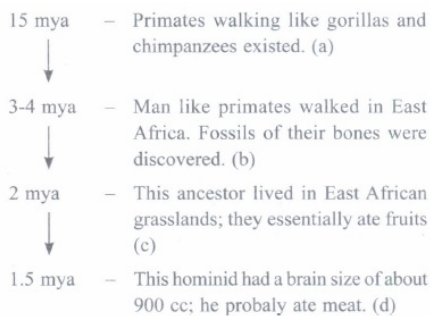
(b) (i) Ichthyosaurs

(ii) About 200 mya.

(c) (i) Tyrannosaurus rex

(ii) About 65 mya.

429) A few stages and their respective time period in the evolutionary history of human beings are mentioned in the flow-chart given below. Answer the questions that follow, as asked.



(a) Name the two primates.

(b) Name two places where the fossils were discovered.

(c) Name the ancestor.

(d) Name the hominid.

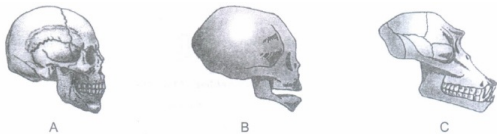
**Answer :** (a) Dryopithecus and Ramapithecus.

(b) Ethiopia and Tanzania

(c) Australopithecus

(d) Homo erectus.

430)



(a) Identify the respective animal to which each of the following skulls, A, B and C belongs.

Which two among them resemble more closely?

(b) Name the (i) ape-like and (ii) man-like primates that existed 15 million years ago.

**Answer :** (a) A. Modern man

B. Baby Chimpanzee

C. Adult Chimpanzee.

Skull of baby chimpanzee resembles more closely the skull of modern man.

(b) (i) Dryopithecus

(ii) Ramapithecus.