

Evolution — NEET Biology PYQ (2005-2021)

Class 12 Biology · 66 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. The factor that leads to Founder effect in a population is :

- (A) Natural selection
- (B) Genetic recombination
- (C) Mutation
- (D) Genetic drift

NEET 2021

2. Match List - I with List - II.

List - I | List - II

(a) Adaptive radiation | (i) Selection of resistant varieties due to excessive use of herbicides and pesticides

(b) Convergent evolution | (ii) Bones of forelimbs in Man and Whale

(c) Divergent evolution | (iii) Wings of Butterfly and Bird

(d) Evolution by anthropogenic action | (iv) Darwin Finches

Choose the correct answer from the options given below.

- (A) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)
- (B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (C) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)
- (D) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

NEET 2020 · Q38

3. From his experiments, S.L. Miller produced amino acids by mixing the following in a closed flask:

- (A) CH₄, H₂, NH₃ and water vapor at 800°C
- (B) CH₃, H₂, NH₄ and water vapor at 800°C
- (C) CH₄, H₂, NH₃ and water vapor at 600°C
- (D) CH₃, H₂, NH₃ and water vapor at 600°C

NEET 2020 · Q39

4. Embryological support for evolution was disapproved by:

- (A) Karl Ernst von Baer
- (B) Alfred Wallace
- (C) Charles Darwin
- (D) Oparin

NEET 2020 · Q44

5. Which of the following refer to correct example(s) of organisms which have evolved due to changes in environment brought about by anthropogenic action?

- (a) Darwin's Finches of Galapagos islands.**
 - (b) Herbicide resistant weeds.**
 - (c) Drug resistant eukaryotes.**
 - (d) Man-created breeds of domesticated animals like dogs.**
- (A) only (a)
 - (B) (a) and (c)
 - (C) (b), (c) and (d)
 - (D) only (d)

NEET 2020 · Q73

6. Flippers of Penguins and Dolphins are examples of:

- (A) Adaptive radiation
- (B) Convergent evolution
- (C) Industrial melanism
- (D) Natural selection

NEET 2019 · Q107

7. In a species, the weight of newborn ranges from 2 to 5 kg. 97% of the newborn with an average weight between 3 to 3.3 kg survive whereas 99% of the infants born with weights from 2 to 2.5 kg or 4.5 to 5 kg die. Which type of selection process is taking place ?

- (A) Directional Selection
- (B) Stabilizing Selection
- (C) Disruptive Selection
- (D) Cyclical Selection

NEET 2019 · Q117

8. Match the hominids with their correct brain size :

- (a) Homo habilis — (i) 900 cc**
- (b) Homo neanderthalensis — (ii) 1350 cc**
- (c) Homo erectus — (iii) 650-800 cc**
- (d) Homo sapiens — (iv) 1400 cc**

Select the correct option.

- (A) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)
- (B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (C) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- (D) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

NEET 2019 · Q118

9. Variations caused by mutation, as proposed by Hugo de Vries, are :

- (A) random and directional
- (B) random and directionless
- (C) small and directional
- (D) small and directionless

NEET 2019 · Q151

10. A gene locus has two alleles A, a. If the frequency of dominant allele A is 0.4, then what will be the frequency of homozygous dominant, heterozygous and homozygous recessive individuals in the population ?

- (A) 0.36 (AA); 0.48 (Aa); 0.16 (aa)
- (B) 0.16 (AA); 0.24 (Aa); 0.36 (aa)
- (C) 0.16 (AA); 0.48 (Aa); 0.36 (aa)
- (D) 0.16 (AA); 0.36 (Aa); 0.48 (aa)

NEET 2018 · Q160

11. According to Hugo de Vries, the mechanism of evolution is

- (A) Phenotypic variations
- (B) Saltation
- (C) Multiple step mutations
- (D) Minor mutations

NEET 2018 · Q177

12. Among the following sets of examples for divergent evolution, select the incorrect option:

- (A) Brain of bat, man and cheetah
- (B) Heart of bat, man and cheetah
- (C) Forelimbs of man, bat and cheetah
- (D) Eye of octopus, bat and man

NEET 2018 · Q179

13. The similarity of bone structure in the forelimbs of many vertebrates is an example of

- (A) Convergent evolution
- (B) Analogy
- (C) Homology
- (D) Adaptive radiation

NEET 2017 · Q129

14. Artificial selection to obtain cows yielding higher milk output represents:

- (A) stabilizing selection as it stabilizes this character in the population.
- (B) directional as it pushes the mean of the character in one direction.
- (C) disruptive as it splits the population into two, one yielding higher output and the other lower output.
- (D) stabilizing followed by disruptive as it stabilizes the population to produce higher yielding cows.

NEET 2017 (Gujarati paper) · Q48

15. Flippers of Penguins and Dolphins are the example of:

- (A) Homologous structure
- (B) Analogous structure
- (C) Divergent evolution
- (D) Radiation

NEET 2017 (Gujarati paper) · Q121

16. Continental drift led to disappearance of a number of South American mammals because:

- (A) there was an outbreak of a number of infectious diseases
- (B) sudden change in the climatic conditions
- (C) they were outcompeted by more highly evolved animals reaching here from North America
- (D) alteration of vegetation was not conducive to their survival

NEET 2016 Phase 2 · Q166

17. Genetic drift operates in

- (A) small isolated population
- (B) large isolated population
- (C) non-reproductive population
- (D) slow reproductive population

NEET 2016 Phase 2 · Q167

18. In Hardy-Weinberg equation, the frequency of heterozygous individual is represented by

- (A) p^2
- (B) $2pq$
- (C) pq
- (D) q^2

NEET 2016 Phase 2 · Q168

19. The chronological order of human evolution from early to the recent is

- (A) Australopithecus → Ramapithecus → Homo habilis → Homo erectus
- (B) Ramapithecus → Australopithecus → Homo habilis → Homo erectus
- (C) Ramapithecus → Homo habilis → Australopithecus → Homo erectus
- (D) Australopithecus → Homo habilis → Ramapithecus → Homo erectus

NEET 2016 Phase 2 · Q169

20. Which of the following is the correct sequence of events in the origin of life?

I. Formation of protobionts

II. Synthesis of organic monomers

III. Synthesis of organic polymers

IV. Formation of DNA-based genetic systems

- (A) I, II, III, IV
- (B) I, III, II, IV
- (C) II, III, I, IV
- (D) II, III, IV, I

NEET 2016 Phase 1 · Q144

21. Which of the following structures is homologous to the wing of a bird?

- (A) Dorsal fin of a Shark
- (B) Wing of a Moth
- (C) Hind limb of Rabbit
- (D) Flipper of Whale

NEET 2016 Phase 1 · Q148

22. Following are the two statements regarding the origin of life:

(a) The earliest organisms that appeared on the earth were non-green and presumably anaerobes.

(b) The first autotrophic organisms were the chemoautotrophs that never released oxygen.

Of the above statements which one of the following options is correct?

- (A) (a) is correct but (b) is false.
- (B) (b) is correct but (a) is false.
- (C) Both (a) and (b) are correct.
- (D) Both (a) and (b) are false.

NEET 2016 Phase 1 · Q150

23. Analogous structures are a result of:

- (A) Divergent evolution
- (B) Convergent evolution
- (C) Shared ancestry
- (D) Stabilizing selection

AIPMT 2015

24. Which of the following had the smallest brain capacity?

- (A) Homo habilis
- (B) Homo erectus
- (C) Homo sapiens
- (D) Homo neanderthalensis

AIPMT 2015

25. Which is the most common mechanism of genetic variation in the population of a sexually-reproducing organism?

- (A) Recombination
- (B) Transduction
- (C) Chromosomal aberrations
- (D) Genetic drift

AIPMT 2015

26. A population will not exist in Hardy-Weinberg equilibrium if:

- (A) the population is large
- (B) individuals mate selectively
- (C) there are no mutations
- (D) there is no migration

AIPMT 2014

27. Which one of the following are analogous structures?

- (A) Gills of Prawn and Lungs of Man
- (B) Thorns of Bougainvillea and Tendrils of Cucurbita
- (C) Flippers of Dolphin and Legs of Horse
- (D) Wings of Bat and Wings of Pigeon

AIPMT 2014

28. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa. Based on this data, the frequency of allele A in the population is:

- (A) 0.5
- (B) 0.6
- (C) 0.7
- (D) 0.4

NEET 2013

29. Variation in gene frequencies within populations can occur by chance rather than by natural selection. This is referred to as

- (A) Genetic flow
- (B) Genetic drift
- (C) Random mating
- (D) Genetic load

NEET 2013

30. The process by which organisms with different evolutionary history evolve similar phenotypic adaptations in response to a common environmental challenge is called

- (A) Natural selection
- (B) Convergent evolution
- (C) Non-random evolution
- (D) Adaptive radiation

NEET 2013

31. The tendency of population to remain in genetic equilibrium may be disturbed by

- (A) random mating
- (B) lack of migration
- (C) lack of mutations
- (D) lack of random mating

NEET 2013

32. The eye of octopus and eye of cat show different patterns of structure, yet they perform similar function. This is an example of

- (A) Homologous organs that have evolved due to convergent evolution
- (B) Homologous organs that have evolved due to divergent evolution
- (C) Analogous organs that have evolved due to convergent evolution
- (D) Analogous organs that have evolved due to divergent evolution

AIPMT 2012 Mains

33. The idea of mutations was brought forth by

- (A) Hugo de Vries, who worked on evening primrose
- (B) Gregor Mendel, who worked on *Pisum sativum*
- (C) Hardy Weinberg, who worked on allele frequencies in a population
- (D) Charles Darwin, who observed a wide variety of organisms during sea voyage

AIPMT 2012 Prelims

34. Which one of the following options gives one correct example each of convergent evolution and divergent evolution?

- (A) Convergent: Thorns of Bougainvillea and tendrils of Cucurbita; Divergent: Eyes of octopus and mammals
- (B) Convergent: Eyes of octopus and mammals; Divergent: Bones of forelimbs of vertebrates
- (C) Convergent: Thorns of Bougainvillea and tendrils of Cucurbita; Divergent: Wings of butterflies and birds
- (D) Convergent: Bones of forelimbs of vertebrates; Divergent: Wings of butterfly and birds

AIPMT 2012 Prelims

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

- (A) Divergent evolution
- (B) Adaptive radiation
- (C) Natural selection
- (D) Migration

AIPMT 2012 Prelims

36. The extinct human who lived 1,00,000 to 40,000 years ago, in Europe, Asia and parts of Africa, with short stature, heavy eye brows, retreating foreheads, large jaws with heavy teeth, stocky bodies, a lumbering gait and stooped posture was

- (A) Ramapithecus
- (B) Homo habilis
- (C) Neanderthal human
- (D) Cro-Magnon humans

AIPMT 2012 Prelims

37. 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 cranial capacity

AIPMT 2011 Prelims

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

- (A) Increasing brain capacity
- (B) Upright posture
- (C) Shortening of jaws
- (D) Binocular vision

AIPMT 2010 Mains · Q15

39. The most apparent change during the evolutionary history of Homo sapiens is traced in

- (A) Loss of body hair
- (B) Walking upright
- (C) Shortening of the jaws
- (D) Remarkable increase in the brain size

AIPMT 2010 Prelims · Q128

40. Darwin's finches are a good example of

- (A) Convergent evolution
- (B) Industrial melanism
- (C) Connecting link
- (D) Adaptive radiation

41. 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) appearance of the darker coloured individuals due to very poor sunlight
- (B) protective mimicry
- (C) inheritance of darker colour character acquired due to the darker environment
- (D) natural selection whereby the darker forms were selected

42. Thorn of *Bougainvillea* and tendril of *Cucurbita* are example of

- (A) Retrogressive evolution
- (B) Analogous organs
- (C) Homologous organs
- (D) Vestigial organs

43. What is true about the isolated small tribal populations?

- (A) There is no change in population size as they have a large gene pool
- (B) There is a decline in population as boys marry girls only from their own tribe
- (C) Hereditary diseases like colour blindness do not spread in the isolated population
- (D) Wrestlers who develop strong body muscles in their life time pass this character on to their progeny

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

- (A) Mendel - Theory of Pangenesis
- (B) Weismann - Theory of continuity of Germplasm
- (C) Pasteur - Inheritance of acquired characters
- (D) de Vries - Natural selection

45. 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 could maintain an internal environment
- (B) They were able to reproduce
- (C) They could separate combinations of molecules from the surroundings
- (D) They were partially isolated from the surroundings

46. Darwin's Finches are an excellent example of

- (A) Connecting links
- (B) Adaptive radiation
- (C) Seasonal migration
- (D) Brood parasitism

47. Which one of the following pairs of items correctly belongs to the category of organs mentioned against it?

- (A) Wings of honey-bee and wings of crow - Homologous organs
- (B) Thorn of *Bougainvillea* and tendrils of *Cucurbita* - Analogous organs
- (C) Nictitating membrane and blind spot in human eye - Vestigial organs
- (D) Nephridia of earthworm and malpighian tubules of cockroach - Excretory organs

AIPMT 2007 Prelims · Q110

48. The concept of chemical evolution is based on

- (A) interaction of water, air and clay under intense heat
- (B) effect of solar radiation on chemicals
- (C) possible origin of life by combination of chemicals under suitable environmental conditions
- (D) crystallization of chemicals

AIPMT 2007 Prelims · Q126

49. 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

AIPMT 2007 Prelims · Q162

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

- (A) microevolution
- (B) co-evolution
- (C) convergent evolution
- (D) divergent evolution

AIPMT 2007 Prelims · Q164

51. Among the human ancestors the brain size was more than 1000 CC in

- (A) Homo erectus
- (B) Ramapithecus
- (C) Homo habilis
- (D) Homo neanderthalensis

AIPMT 2007 Prelims · Q165

52. 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 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

AIPMT 2007 Prelims · Q174

53. Adaptive radiation refers to

- (A) evolution of different species from a common ancestor
- (B) migration of members of a species to different geographical areas
- (C) power of adaptation in an individual to a variety of environments
- (D) adaptations due to geographical isolation

AIPMT 2007 Prelims · Q176

54. Select the correct statement 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

AIPMT 2007 Prelims · Q181

55. What is common to whale, seal and shark?

- (A) thick subcutaneous fat
- (B) convergent evolution
- (C) homoiothermy
- (D) seasonal migration

AIPMT 2007 Prelims · Q182

56. 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

AIPMT 2006 Prelims · Q112

57. Which one of the following aminoacids was not found to be synthesized in Miller's experiment ?

- (A) Glycine
- (B) Aspartic acid
- (C) Glutamic acid
- (D) Alanine

AIPMT 2006 Prelims · Q147

58. An important evidence in favour of organic evolution is the occurrence of :

- (A) homologous and vestigial organs
- (B) analogous and vestigial organs
- (C) homologous organs only
- (D) homologous and analogous organs

AIPMT 2006 Prelims · Q148

59. Which one of the following is not a living fossil ?

- (A) King crab
- (B) Sphenodon
- (C) Archaeopteryx
- (D) Peripatus

AIPMT 2006 Prelims · Q159

60. Evolutionary history of an organism is known as :

- (A) Phylogeny
- (B) Ancestry
- (C) Paleontology
- (D) Ontogeny

AIPMT 2005 Prelims · Q102

61. There are two opposing views about origin of Modern man. According to one view *Homo erectus* in Asia were the ancestors of modern man. A study of variations of DNA however suggested African origin of Modern man. What kind of observation on DNA variation could suggest this ?

- (A) Greater variation in Africa than in Asia
- (B) Variation only in Asia and no variation in Africa
- (C) Greater variation in Asia than in Africa
- (D) Similar variation in Africa and Asia

AIPMT 2005 Prelims · Q141

62. Which one of the following phenomena 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

63. Which of the following is not true for a species ?

- (A) Members of a species can interbreed
- (B) Variations occurs among members of a species
- (C) Each species is reproductively isolated from every other species
- (D) Gene flow does not occur between the populations of a species

64. At a particular locus, frequency of 'A' allele is 0.6 and that of 'a' is 0.4. What would be the frequency of heterozygotes in a random mating population at equilibrium ?

- (A) 0.16
- (B) 0.48
- (C) 0.36
- (D) 0.24

65. Which one of the following experiments suggests that simplest living organisms could not have originated spontaneously from non-living matter ?

- (A) Microbes did not appear in stored meat
- (B) Larvae could appear in decaying organic matter
- (C) Microbes appeared from unsterilized organic matter
- (D) Meat was not spoiled, when heated and kept sealed in a vessel

66. de Vries gave his mutation theory on organic evolution while working on :

- (A) *Althea rosea*
- (B) *Drosophila melanogaster*
- (C) *Oenothera lamarckiana*
- (D) *Pisum sativum*

Answer key and explanations

1. Answer: (D) Genetic drift

When a small group breaks away and its allele frequencies change by chance, the new population ends up with a different gene pool; this chance change is genetic drift, and the founder effect is a case of it. Natural selection changes allele frequencies because of fitness differences, not by chance.

2. Answer: (A) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Darwin's finches show adaptive radiation, wings of butterfly and bird are analogous organs showing convergent evolution, forelimbs of man and whale are homologous organs showing divergent evolution, and resistance after heavy herbicide and pesticide use is evolution by anthropogenic action. Hence (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i).

3. Answer: (A) CH_4 , H_2 , NH_3 and water vapor at 800°C

Miller made amino acids by passing electric sparks through a closed flask of CH_4 , H_2 , NH_3 and water vapour at 800°C . CH_3 is a radical and NH_4 is not a gas, so those options are wrong, and the temperature used was 800°C , not 600°C .

4. Answer: (A) Karl Ernst von Baer

Ernst Haeckel argued that embryos of all vertebrates share features absent in adults, and Karl Ernst von Baer rejected this, noting that embryos never pass through the adult stages of other animals. Darwin and Wallace proposed natural selection, and Oparin worked on the origin of life.

5. Answer: (C) (b), (c) and (d)

Herbicide-resistant weeds, drug-resistant eukaryotes and man-made breeds of dogs all evolved because of human action (chemicals or artificial selection). Darwin's finches arose by natural adaptive radiation on the Galapagos, not through human activity.

6. Answer: (B) Convergent evolution

Penguin flippers (bird wing) and dolphin flippers (mammal forelimb) have similar function and shape but come from different lineages, an example of convergent evolution (analogy). Adaptive radiation is divergence from a common ancestor, and industrial melanism is a case of natural selection in moths.

7. Answer: (B) Stabilizing Selection

Individuals with the average (intermediate) weight survive while both extremes die, which is stabilizing selection. Disruptive selection would favour both extremes, and directional selection would favour only one extreme.

8. Answer: (C) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Per NCERT, *Homo habilis* had a brain of 650–800 cc, *Homo erectus* about 900 cc, Neanderthal man about 1400 cc and modern *Homo sapiens* about 1350 cc. The trap is assuming modern humans have the largest brain; Neanderthals had a slightly larger one.

9. Answer: (B) random and directionless

De Vries described mutations as large, sudden, random and directionless, in contrast to Darwin's small, directional variations. 'Small' describes Darwinian variation, not mutation.

10. Answer: (C) 0.16 (AA); 0.48 (Aa); 0.36 (aa)

$p = 0.4$ so $q = 0.6$. By Hardy-Weinberg, $AA = p^2 = 0.16$, $Aa = 2pq = 2 \times 0.4 \times 0.6 = 0.48$ and $aa = q^2 = 0.36$. Forgetting the factor 2 in $2pq$ gives 0.24, the main trap.

11. Answer: (B) Saltation

From his work on evening primrose, de Vries proposed that new species arise by large, sudden mutations producing single-step jumps, which he called saltation. Darwin, in contrast, stressed small continuous variations, so minor or multiple-step changes describe Darwinian ideas, not de Vries.

12. Answer: (D) Eye of octopus, bat and man

The eyes of octopus (a mollusc) and of mammals have similar function but different origin, so they are analogous organs produced by convergent evolution. The brain, heart and forelimbs of bat, man and cheetah share a common mammalian origin and are homologous, showing divergent evolution.

13. Answer: (C) Homology

Forelimbs of whales, bats, cheetahs and humans have the same basic pattern of bones (humerus, radius-ulna, carpals, metacarpals, phalanges) though they do different jobs, which shows common ancestry: these are homologous organs. Analogy and convergent evolution refer to similar function with different structure and origin.

14. Answer: (B) directional as it pushes the mean of the character in one direction.

Choosing only high-yielding cows for breeding generation after generation moves the mean milk yield of the population steadily towards one extreme, which is directional selection. Stabilising selection favours the average value, and disruptive selection favours both extremes.

15. Answer: (B) Analogous structure

Penguin flippers are modified bird wings while dolphin flippers are modified mammalian forelimbs; they look alike and do the same job (swimming) because of similar habitat, which is convergent evolution producing analogous structures. They are not homologous in the sense intended, since their resemblance is due to function rather than shared ancestry of the flipper form.

16. Answer: (C) they were outcompeted by more highly evolved animals reaching here from North America

When South America joined North America, the native pouched mammals of South America were overridden and outcompeted by North American fauna that migrated in. Disease outbreaks or climatic shifts are not the explanation NCERT gives.

17. Answer: (A) small isolated population

Genetic drift is a random change in allele frequency by chance, and its effect is strongest in small, isolated populations such as those formed by founder effect or bottlenecks. In large populations chance changes even out, and a non-reproducing population passes on no alleles at all.

18. Answer: (B) $2pq$

From $(p + q)^2 = p^2 + 2pq + q^2 = 1$, the heterozygote frequency is $2pq$, because the heterozygote can form in two ways. p^2 and q^2 are the frequencies of the two homozygotes, and pq on its own is only half the heterozygote frequency.

19. Answer: (B) Ramapithecus → Australopithecus → Homo habilis → Homo erectus

Ramapithecus lived about 15 million years ago, Australopithecines about 2 million years ago, then *Homo habilis*, followed by *Homo erectus* about 1.5 million years ago. Putting Australopithecus before Ramapithecus, or *Homo habilis* before Australopithecus, breaks this NCERT sequence.

20. Answer: (C) II, III, I, IV

Chemical evolution first formed simple organic monomers, which joined into polymers; these then gathered into protobionts (coacervates), and DNA-based genetic systems arose last after RNA-based ones. Sequences that start with protobionts, or place the DNA genetic system before protobionts, do not fit this order.

21. Answer: (D) Flipper of Whale

The bird's wing is a modified forelimb, and the whale's flipper is also a forelimb with the same basic bone plan (humerus, radius-ulna, carpals, digits), so they are homologous. The moth's wing is only analogous, a shark's dorsal fin is not a limb, and a hind limb is not the corresponding forelimb.

22. Answer: (C) Both (a) and (b) are correct.

The first life forms arose in an oxygen-free atmosphere, so they were non-green anaerobic heterotrophs. The earliest autotrophs were chemoautotrophs that obtained energy from inorganic chemical reactions and did not release oxygen; oxygen-releasing photosynthesis came later with cyanobacteria-like organisms.

23. Answer: (B) Convergent evolution

Analogous structures, such as wings of butterflies and birds, perform similar functions but have different origins; they arise when unrelated lineages adapt to similar environments (convergent evolution). Divergent evolution from shared ancestry produces homologous structures.

24. Answer: (A) Homo habilis

Homo habilis had a brain of about 650-800 cc, smaller than Homo erectus (about 900 cc), Neanderthal man (about 1400 cc) and modern humans (about 1350-1450 cc).

25. Answer: (A) Recombination

In sexually reproducing organisms, crossing over and independent assortment in meiosis and random fusion of gametes recombine genes every generation, so recombination is the most common source of variation. Transduction is a bacterial process, and chromosomal aberrations are rare.

26. Answer: (B) individuals mate selectively

Hardy-Weinberg equilibrium requires a large population, random mating, no mutation, no migration and no selection. Selective (non-random) mating changes genotype frequencies, so the population will not remain in equilibrium.

27. Answer: (A) Gills of Prawn and Lungs of Man

Gills of prawn and lungs of man both carry out respiration but differ in origin and structure, so they are analogous. Thorns of Bougainvillea and tendrils of Cucurbita are both modified stems, flippers of dolphin and legs of horse are both pentadactyl forelimbs, and bat and pigeon wings share the vertebrate forelimb pattern, so these are homologous.

28. Answer: (B) 0.6

Each AA individual carries two A alleles and each Aa carries one, so frequency of A = $(2 \times 360 + 480) / (2 \times 1000) = 1200/2000 = 0.6$. The value 0.4 is the frequency of allele a, not A.

29. Answer: (B) Genetic drift

A change in allele frequency that happens by chance, not by selection, is genetic drift, and it is strongest in small populations. Gene flow is change due to migration, not chance.

30. Answer: (B) Convergent evolution

When unrelated lineages facing similar environments evolve similar adaptations, the process is convergent evolution, which produces analogous structures. Adaptive radiation is the opposite pattern, where one ancestor gives rise to many differently adapted forms.

31. Answer: (D) lack of random mating

Hardy-Weinberg equilibrium needs random mating, no migration, no mutation, no selection and a large population. Lack of random mating disturbs the equilibrium, whereas random mating and absence of migration or mutation help maintain it.

32. Answer: (C) Analogous organs that have evolved due to convergent evolution

The eyes of octopus (a mollusc) and cat (a mammal) differ in structure and origin but perform the same function, so they are analogous organs, which arise by convergent evolution. Homologous organs share origin but may differ in function.

33. Answer: (A) Hugo de Vries, who worked on evening primrose

Hugo de Vries proposed the mutation theory after his work on the evening primrose (*Oenothera lamarckiana*), describing sudden large changes that he called mutations. Darwin stressed small continuous variations, and Mendel described factors, not mutations.

34. Answer: (B) Convergent: Eyes of octopus and mammals; Divergent: Bones of forelimbs of vertebrates

Eyes of octopus and mammals are analogous structures that evolved independently (convergent evolution), while the forelimb bones of vertebrates are homologous structures from a common ancestor (divergent evolution). Thorns of Bougainvillea and tendrils of Cucurbita are homologous, not convergent, and wings of butterflies and birds are analogous, not divergent.

35. Answer: (B) Adaptive radiation

Adaptive radiation is the evolution of different species from a single ancestral point, radiating into other geographical areas and habitats, as in Darwin's finches. Divergent evolution describes homologous structures in general, not this pattern of spread.

36. Answer: (C) Neanderthal human

The Neanderthal man lived about 1,00,000 to 40,000 years ago in Europe, Asia and parts of Africa, with short stocky bodies, heavy brow ridges, retreating foreheads and large jaws. Cro-Magnon was a later modern human, and Ramapithecus and Homo habilis are much older.

37. Answer: (D) Increasing cranial capacity

The most significant trend in human evolution was the increase in cranial capacity (brain size), from about 650–800 cc in Homo habilis to about 1400 cc in Homo sapiens. Upright posture and binocular vision appeared earlier and are shared with other hominids or primates.

38. Answer: (A) Increasing brain capacity

The most significant trend in the evolution of modern humans was the steady increase in brain capacity, from about 650–800 cc in Homo habilis to around 1,400 cc in Homo sapiens. Upright posture appeared much earlier, in the australopithecines.

39. Answer: (D) Remarkable increase in the brain size

Across the human lineage the most marked trend is the steady rise in cranial capacity, from about 650–800 cc in Homo habilis, to about 900 cc in Homo erectus, to about 1400 cc in Homo sapiens. Upright walking appeared early and changed little afterwards, so it is not the most apparent trend through the lineage.

40. Answer: (D) Adaptive radiation

From an ancestral seed-eating finch, many species with different beak shapes evolved on the Galapagos Islands to use different foods. Many forms branching from one ancestor into different habitats is adaptive radiation. Convergent evolution is the reverse: unrelated lineages becoming similar.

41. Answer: (D) natural selection whereby the darker forms were selected

On soot-darkened tree trunks the dark moths were less visible to predatory birds and survived and reproduced more, so their frequency increased; NCERT uses this industrial melanism as an example of natural selection. It is camouflage, not mimicry of another species, and not inheritance of acquired characters.

42. Answer: (C) Homologous organs

Both the thorn of Bougainvillea and the tendril of Cucurbita are modified axillary branches (stem origin) that now do different jobs, which makes them homologous, the NCERT example of divergent evolution. Analogous organs would share function but differ in origin.

43. Answer: (B) There is a decline in population as boys marry girls only from their own tribe

A small isolated tribe has a small gene pool and no gene flow, so marriage within the tribe leads to inbreeding depression and can contribute to population decline. Inbreeding actually helps recessive hereditary disorders like colour blindness spread, and acquired traits such as a wrestler's muscles are not inherited.

44. Answer: (B) Weismann - Theory of continuity of Germplasm

August Weismann proposed the continuity of germplasm, holding that only changes in germ cells are inherited. Pangenesis was Darwin's idea, inheritance of acquired characters was Lamarck's, and de Vries gave the mutation theory.

45. Answer: (B) They were able to reproduce

Protobionts such as coacervates and microspheres were membrane-bounded droplets that kept an internal environment partly separate from their surroundings, but they lacked genetic material and so could not truly reproduce. Maintaining an internal environment is a correct property, not the incorrect one.

46. Answer: (B) Adaptive radiation

From a seed-eating ancestor, Galapagos finches diversified into many species with different beaks suited to different diets, which NCERT presents as the classic case of adaptive radiation. They are not intermediates between two groups, so 'connecting links' does not apply.

47. Answer: (D) Nephridia of earthworm and malpighian tubules of cockroach - Excretory organs

Nephridia in earthworm and Malpighian tubules in cockroach are both excretory organs. Wings of bee and crow are analogous (not homologous), thorn and tendril are homologous (not analogous), and the blind spot is just where the optic nerve leaves the eye, not a vestigial organ.

48. Answer: (C) possible origin of life by combination of chemicals under suitable environmental conditions

Chemical evolution (Oparin-Haldane) proposes that life arose when simple inorganic and organic molecules combined into more complex ones under the conditions of the early Earth, as Miller's experiment imitated. Solar radiation or heat were only energy sources within this idea, not the concept itself.

49. Answer: (C) biogeographical evolution

Darwin's finches on the Galapagos show how one ancestral seed-eating stock spread over the islands and radiated into many forms with different beaks, which is evidence for evolution from geographical distribution (biogeography and adaptive radiation). They contradict special creation and do not show retrogressive evolution.

50. Answer: (C) convergent evolution

Unrelated lineages that evolve similar features because they adapt to similar habitats show convergent evolution, producing analogous structures. Divergent evolution is the opposite, where related forms become different.

51. Answer: (D) Homo neanderthalensis

Neanderthal man had a brain of about 1400 cc. Homo erectus had about 900 cc and Homo habilis about 650-800 cc, so they fall below 1000 cc, and Ramapithecus was an ape-like hominid.

52. Answer: (D) the true black melanic forms arise by a recurring random mutation

Dark (melanic) moths existed before industrialisation because the melanic allele keeps arising by random mutation; soot-darkened trees only made them better camouflaged so natural selection increased their numbers. Pollution did not create melanism, and the dark form clearly had an advantage in industrial areas.

53. Answer: (A) evolution of different species from a common ancestor

Adaptive radiation is the evolution of many different species from one ancestral form as they spread into different habitats, as in Darwin's finches or Australian marsupials. Simple migration or an individual's adaptability is not speciation.

54. Answer: (A) Fitness is the end result of the ability to adapt and gets selected by nature

NCERT describes fitness as the end result of an organism's ability to adapt and be selected by nature. Mutations are random and directionless while Darwinian variations are small and directional, and whales and camels also have seven cervical vertebrae (sloths and manatees are the exceptions).

55. Answer: (B) convergent evolution

Whale and seal are mammals and the shark is a fish, yet all have streamlined bodies and flippers or fins for aquatic life; this similarity in unrelated groups is convergent evolution. Shark is cold-blooded and lacks blubber, so homoiothermy and subcutaneous fat do not apply to all three.

56. Answer: (B) speciation through reproductive isolation

Geographically separated populations stop exchanging genes, accumulate different variations and eventually become reproductively isolated, forming new species (allopatric speciation). Isolation promotes rather than prevents speciation.

57. Answer: (C) Glutamic acid

Miller's spark-discharge experiment produced simple amino acids such as glycine, alanine and aspartic acid. Glutamic acid was not among those reported, so it is the odd one.

58. Answer: (A) homologous and vestigial organs

Homologous organs show common ancestry with divergent evolution, and vestigial organs are remnants of organs functional in ancestors; both support organic evolution. Analogous organs come from convergent evolution and do not show common descent.

59. Answer: (C) Archaeopteryx

Archaeopteryx is an extinct Jurassic fossil bird with reptile features, a connecting link. King crab, Sphenodon and Peripatus are living species that have changed little over long times, i.e. living fossils.

60. Answer: (A) Phylogeny

Phylogeny is the evolutionary history of a species or group. Ontogeny is the development of a single individual from zygote to adult.

61. Answer: (A) Greater variation in Africa than in Asia

Mutations pile up over time, so the oldest human population carries the most genetic diversity. Greater DNA (mitochondrial) variation in African populations than in Asian ones shows that humans lived longest in Africa, which points to an African origin. Greater variation in Asia would instead support an Asian origin.

62. Answer: (C) Prevalence of pesticide resistant insects

When a pesticide is used, the rare resistant insects survive and reproduce, so resistance spreads through the population. This is natural selection working on existing variation. Transgenics, cloning and stem-cell organs are human technologies, not natural selection.

63. Answer: (D) Gene flow does not occur between the populations of a species

Populations of one species can interbreed, so gene flow does take place between them, and the statement that it does not is false. Interbreeding, variation within the species and reproductive isolation from other species are all true of a biological species.

64. Answer: (B) 0.48

By the Hardy-Weinberg principle, the heterozygote frequency is $2pq = 2 \times 0.6 \times 0.4 = 0.48$. 0.36 (p^2) and 0.16 (q^2) are the frequencies of the two homozygotes.

65. Answer: (D) Meat was not spoiled, when heated and kept sealed in a vessel

When the material was heated (sterilised) and sealed off from outside microbes, it did not spoil. This shows that life comes from pre-existing life (Spallanzani/Pasteur-type experiments). Microbes appearing in unsterilised material is exactly what spontaneous generation was wrongly claimed to explain.

66. Answer: (C) Oenothera lamarckiana

Hugo de Vries based his mutation theory on sudden large variations he saw in the evening primrose, *Oenothera lamarckiana*. *Drosophila* was Morgan's organism and *Pisum sativum* was Mendel's.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.