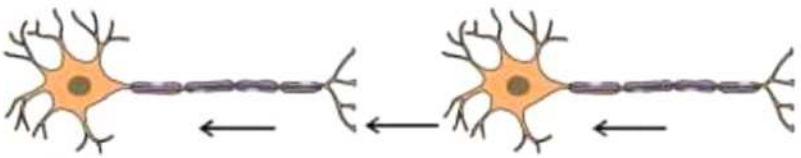
(b) testosterone / estrogen
(c) estrogen / growth hormone
(d) growth hormone / testosterone

65. Select the mis-matched pair
(a) Adrenaline : Pituitary gland
(b) Testosterone: Testes
(c) Estrogen : Ovary
(d) Thyroxin : Thyroid gland

66. What is the correct direction of flow of electrical impulses?

(a)



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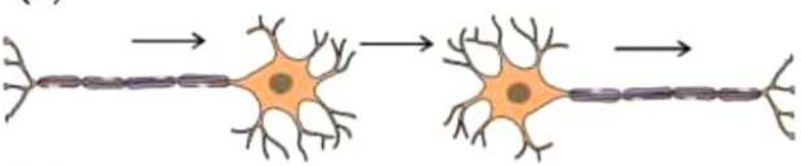

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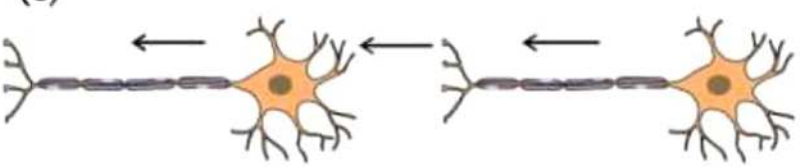
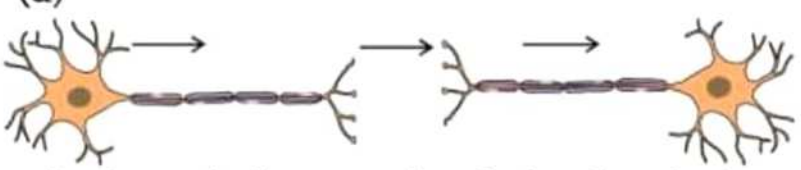


(d)



67. The hypothalamus, pineal gland and pitutary gland are located in the
(a) brain
(b) kidneys
(c) lungs
(d) heart

(d) seeds use oxygen and release carbon dioxide which is absorbed by potassium hydroxide.

Hints & SOLUTIONS

1. **(a)** The process of repairing and maintaining requires molecular movements in life. When there is a bleeding from the cut finger, these molecular movements not only helps to stop the bleeding but also helps in healing the wounds.
2. **(b)** Enzymes are proteins that catalyze chemical reactions. Almost all processes in a biological cell need enzymes in order to occur at significant rates. The set of enzymes made in a cell determines which metabolic pathways occur in that cell.
3. **(d)** Earthworm respires, but has no respiratory organs, exchange of gases takes place through moist skin.
4. **(d)**
5. **(b)** The gaseous exchange is the simple diffusion of oxygen from alveolar air into the blood and diffusion of CO_2 from blood to alveolar air.
6. **(c)** Photosynthesis uses light energy and carbon dioxide to make triose phosphates (G3P). G3P is generally considered as the prime end-product of photosynthesis. It can be used as an immediate food nutrient, or combined and rearranged to form monosaccharide sugars, such as glucose, which can be transported to other cells, or packaged for storage as insoluble polysaccharides such as starch.
7. **(a)** Saliva is the watery and usually frothy substance produced in the mouths of humans and some animals. In animals, saliva is produced in and secreted from the salivary glands. Saliva contains the enzyme amylase that breaks down some starches into maltose and dextrin. Thus, digestion of food occurs within the mouth, even before food reaches the stomach.
8. **(d)**
9. **(a)**
10. **(c)**
11. **(c)** Gastric juice is a strong acidic liquid, pH 1 to 3, which is close to being colourless. The hormone gastrin is released into the bloodstream when

peptides are detected in the stomach. This causes gastric glands in the lining of the stomach to secrete gastric juice. Its main components are digestive enzymes pepsin and rennin, hydrochloric acid, and mucus.

12. **(c)** In cell biology, a mitochondrion is a membrane-enclosed organelle, found in most eukaryotic cells. Mitochondria are "cellular power plants," because they generate most of the cell's supply of ATP, used as a source of chemical energy. Each pyruvate molecule produced by glycolysis is actively transported across the inner mitochondrial membrane, and into the matrix where it is oxidized and combined with coenzyme A to form CO_2, acetyl-CoA and NADH.
13. **(a)**
14. **(a)**
15. **(a)** The left atrium receives oxygenated blood from the lungs through two parts of pulmonary veins.
16. **(a)** Small intestine is the largest part of the human alimentary canal whose length is approximately 7.2 m.
17. **(b)** De-oxygenated blood enters the right atrium of the heart and flows into the right ventricle where it is pumped through the pulmonary arteries to the lungs. Pulmonary veins return the now oxygen-rich blood to the heart, where it enters the left atrium before flowing into the left ventricle. From the left ventricle the oxygen-rich blood is pumped out via the aorta, and on to the rest of the body.
18. **(a)**
19. **(a)** Cardiac impulse (Heart beat) normally originate from the pacemaker (S.A. node).
20. **(c)**
21. **(a)** Sensory receptor, in physiology, any structure which, on receiving environmental stimuli, produces an informative nerve impulse.
22. **(c)** Blood oxygenation is measured in several ways, but the most important measure is the haemoglobin (Hb) saturation percentage. The

haemoglobin molecule is the primary transporter of oxygen in mammals.

23. **(d)**
24. **(d)**
25. **(a)**
26. **(b)** A sphygmomanometer or blood pressure meter is a device used to measure blood pressure, comprising an inflatable cuff to restrict blood flow, and a mercury or mechanical manometer to measure the pressure. Manual sphygmomanometers are used in conjunction with a stethoscope.
27. **(a)** Transpiration is the evaporation of water from aerial parts and of plants, especially leaves but also stems, flowers and fruits. Transpiration is a side effect of the plant need to open its stomata in order to obtain carbon dioxide gas from the air for photosynthesis. Transpiration also cools plants and enables mass flow of mineral nutrients from roots to shoots.
28. **(b)**
29. **(d)**
30. **(d)**
31. **(c)** A nephron is the basic structural and functional unit of the kidney. Its chief function is to regulate water and soluble substances by filtering the blood, reabsorbing what is needed and excreting the rest as urine.
32. **(a)** In medicine, dialysis is a type of renal replacement therapy which is used to provide an artificial replacement for lost kidney function due to renal failure.Dialysis may be used for very sick patients who have suddenly lost their kidney function (acute renal failure) or for quite stable patients who have permanently lost their kidney function (end stage renal failure).
33. **(d)**
34. **(a)**
35. **(d)**
36. **(b)** Resin is a hydrocarbon secretion of many plants, particularly coniferous trees, valued for its chemical constituents and uses such as varnishes,

adhesives, as an important source of raw materials for organic synthesis, or for incense and perfume. Gum is also a byproduct produced and is sent out through the bark of the tree.

37. **(c)** Control and co-ordination in an organism is provided by the nervous system. The nervous system consists of the brain and the spinal cord and the nerves.

38. **(d)** 39. **(d)** 40. **(d)**

41. **(c)** An action potential is a "spike" of electrical discharge that travels along the membrane of a cell.

42. **(a)** Chemical synapses are specialized junctions through which the cells of the nervous system signal to each other and to non-neuronal cells such as those in muscles or glands. Chemical synapses allow the neurons of the central nervous system to form interconnected neural circuits.

43. **(d)** 44. **(d)** 45. **(c)**

46. **(b)** Neurons are electrically excitable cells in the nervous system that process and transmit information. In vertebrate animals, neurons are the core components of the brain, spinal cord and peripheral nerves.

47. **(d)** A reflex arc is the neural pathway that mediates a reflex action. In higher animals, most sensory neurons do not pass directly into the brain, but synapse in the spinal cord. This characteristic allows reflex actions to occur relatively quickly by activating spinal motor neurons without the delay of routing signals through the brain, although the brain will receive sensory input while the reflex action occurs.

48. **(c)** 49. **(b)** 50. **(c)**

51. **(a)** The peripheral nervous system is part of the nervous system, and consists of the nerves and neurons that reside or extend outside the central nervous system (the brain and spinal cord) to serve the limbs and organs, for example.

52. **(a)** The prosencephalon (fore brain), the mesencephalon (midbrain), and rhombencephalon (hindbrain) are the three primary portions of the brain

during early development of the central nervous system. Fore-brain is the main thinking part of brain.

53. **(c)** **54.** **(c)**

55. **(d)**

56. **(d)** It controls autonomic functions and relays nerve signals between the brain and spinal cord.The Medulla oblongata is responsible for controlling several major autonomic functions of the body : respiration (via dorsal respiratory group and ventral respiratory group), blood pressure, heart rate, reflex arcs and vomiting.

57. **(a)** The skull is a bony structure found in many animals which serves as the general framework for the head. Those animals having skulls are called Craniates. The skull supports the structures of the face and protects the head against injury. The skull is made up of two bones: the cranium and the mandible.

58. **(b)** The cerebellum is a region of the brain that plays an important role in the integration of sensory perception and motor output. Many neural pathways link the cerebellum with the motor cortex which sends information to the muscles causing them to move and the spinocerebellar tract which provides feedback on the position of the body in space (proprioception).

59. **(c)** Thyroxine is critical to the regulation of metabolism and growth throughout the animal kingdom.Calcium is required for the thyroid gland to make thyroxine hormone.

60. **(c)**

61. **(c)**

62. **(a)** In mammals, the adrenal gland also known as suprarenal glands are the triangle-shaped endocrine glands that sit on top of the kidneys; their name indicates that position.

63. **(c)** The pancreas is a gland organ in the digestive and endocrine systems of vertebrates. It is both exocrine (secreting pancreatic juice containing digestive enzymes) and endocrine (producing several im-

portant hormones, including insulin, glucagon, and somatostatin).

64. **(b)** Testosterone is a steroid hormone from the androgen group. Testosterone is primarily secreted in the testes of males. It is the principal male sex hormone and an anabolic steroid. Estrogens are a group of steroid compounds, named for their importance in the estrous cycle, and functioning as the primary female sex hormone.

65. **(a)**

66. **(c)**

67. **(a)** The hypothalamus links the nervous system to the endocrine system via the pituitary gland.The hypothalamus, is located below the thalamus, just above the brain stem. The pineal gland is a small endocrine gland in the brain. It is shaped like a tiny pine cone, and is located near the center of the brain, between the two hemispheres, tucked in a groove where the two rounded thalamic bodies join. The pituitary gland, or hypophysis, is an endocrine gland about the size of a pea that sits in a small, bony cavity covered by a dual fold at the base of the brain.

Chapter 4

Genetics Heredity & Evolution

GENETICS

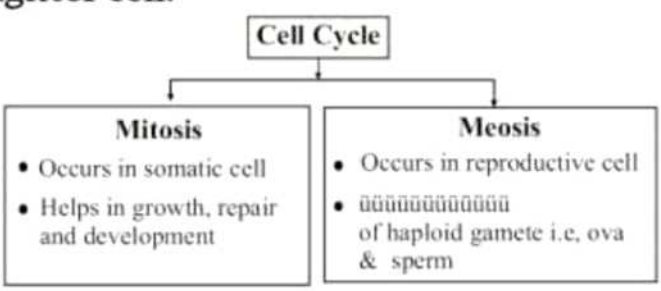
- Study of heredity and variation is called genetics.
- Term genetics was given by - Bateson.
- Father of genetics - Gregor Johann Mendel.
- Father of experimental genetics - Thomas Hunt Morgan.
- Father of human genetics - Archibald Garrod.

Gene

- It is a segment of DNA and basic unit of heredity. These are located on chromosomes.

Cell cycle

- It is a sequence of events in which cell duplicates its genetic material, synthesises other constituents of cell and finally devides into two daughter cell.



Chromosome

- Thread like structure in nucleus
- Each chromosome is made up of two chromatids
- Diploid – Chromosomes in pair
- Haploid – Set of unpaired chromosome

DNA

- DNA is found in nucleus, and also found in mitochondria and chloroplast.
- It stands for **deoxyribonucleic acid (DNA)**.
- It is double stranded.
- It consists of nitrogenous bases-**Adenine, Thymine, Cytosine** or **Guanine**, 5-carbon sugar and a phosphate molecule.
- Structural model of DNA – Watson and Crick

- DNA molecule consists of two polynucleotide strands, forming a double helix.
- Sugar + Nitrogen base = Nucleoside
- Sugar + Nitrogen base + phosphate = Nucleotide.

RNA

- It stands for ribonucleic acid
- It is made up of phosphate + ribose sugar + nitrogen base (uracil, adenine, guanine, cytosine)
- **RNA types** : (1) Massenger RNA (mRNA) ⇒ Brings message from DNA in nucleus to cytoplasm in coded form.
  (2) Transfer RNA (tRNA) ⇒ Carrier of amino acid and transfer it to ribosome
  (3) Ribosomal RNA (rRNA) ⇒ Present in ribosome which is the site of protein synthesis

DIFFERENCE BETWEEN RNA AND DNA

	DNA		RNA
1	Sugar is deoxyribose type.	1	Sugar is ribose type.
2	It is double stranded structure.	2	It is single stranded structure.
3	It contains the base adenine, thymine and cytosine and guanine.	3	It contains uracil in the place of thymine
4	It is mainly found in nucleus.	4	It is foundin both nucleus and cytoplasm

- The transmission of characters from parent to their offsprings is known as **heredity**.
- **Variation** is the difference in the characters or traits among the individuals of a species.
- **Factor** is a particulate entity that functions as a unit of inheritance passing from generation to generation and controlling expression of a character, generally alongwith another factor of the same character.
- **Alleles** are various forms of a gene which occur at the same particular position or gene locus over the chromosome. In higher plants and animals, there are two alleles of a gene called **allelomorphs** or allelomorphic pair that may express the same trait or different traits of a character, *e.g.*, TT, T*t*, *tt*.
- **Homozygous** is an individual having identical alleles of a gene, *e.g.*, TT, *tt*.

- **Heterozygous** is an individual having both the contrasting alleles of a character is called hybrid or heterozygous individual, *e.g.* T*t*.
- Dominant gene trait is an expressed characteristic trait within an organism.
- Recessive gene trait is an unexpressed characteristic within an organism through the gene for it is present.
- Paired condition of chromosomes is known as **diploid**.
- Unpaired condition of chromosomes is known as **haploid**.

MENDEL'S LAWS OF INHERITANCE

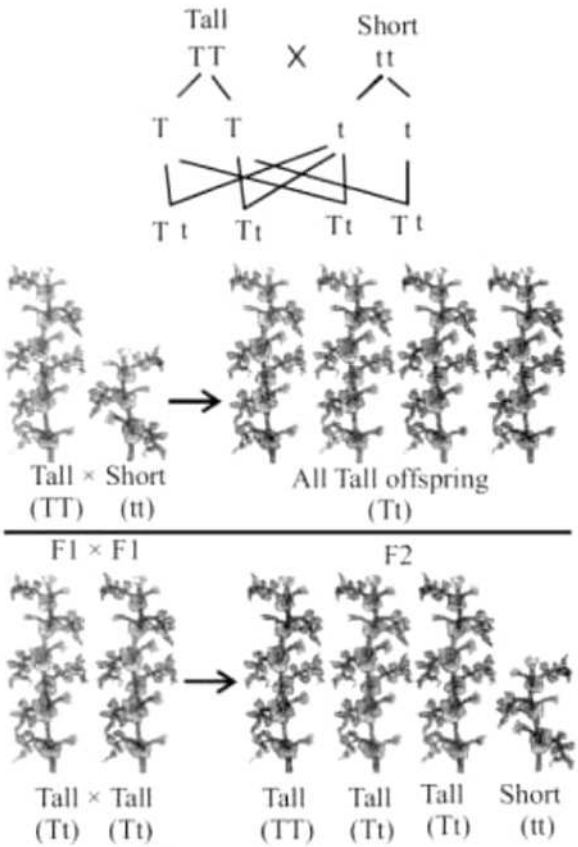
The first study of inheritance was done by **Gregor Mendel** on garden pea (*Pisum sativum*). He used a number of contrasting characters like round / wrinkled seeds, tall/ short plants, white/ violet flowers and so on.

(i) Law of Dominance : Out of a pair of allelomorphic characters one is dominant (expressed) and the other is recessive/unexpressed. The benefit of this law is that recessive (harmful) characters not expressed in hybrid and can exist for several generations.

(ii) Law of Segregation : The factors for each character segregate during gametogenesis. As a result, each gamete receives only one factor for each character and hence is always pure.

(iii) Law of Independent Assortment : The two factors of each trait assort at random and independent of the factors of other trait at the time of meiosis and get randomly as well as independently arranged in the offspring.

- **Genotype** is the composition of genes present in an organism and the characteristic which is visible in an organism is called its **phenotype**.
- When two parents cross (or breed) to produce progeny (or offsprings), then their progeny is called **F_1-generation (First Filial Generation)** and when the first generation progeny cross among themselves to produce second progeny, then this progeny is called **F_2-generation Second Filial Generation.**



Inheritance of traits over two generations

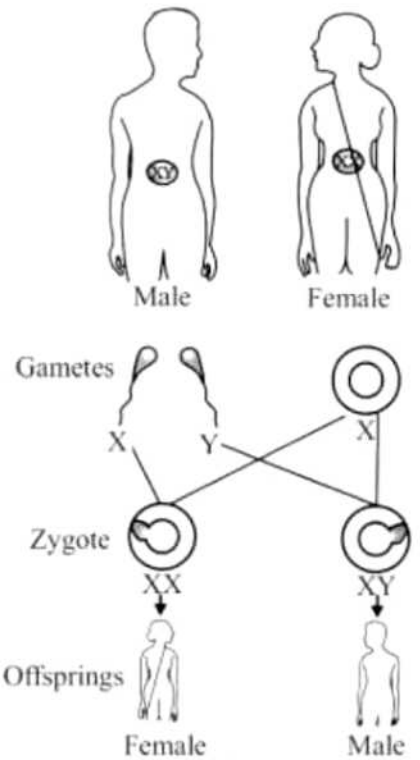
- **Monohybrid Cross and Dihybrid Cross**
- When **tall pea plants** are crossed with **short pea plants** then in **F_1 generation** only tall plants were obtained.
- F_2 progeny of F_1 tall plants are not all tall but one quarter of them are short indicating that both tallness and shortness traits were inherited in F_1 but only tallness trait was expressed due to dominance. Both the traits appear in the ratio of 3 : 1 (three tall and one dwarf). It is called **monohybrid ratio**.
- In dihybrid cross two pairs of contrasting characters were considered. Tall plant with round seeds were crossed with short plant with wrinkled seeds. In F_1 tall plants with round seeds were obtained. On selfing these F_1 plants F_2 showed tall plants with round seeds, short plant with wrinkled seeds and same new combinations (tall plant with wrinkled seeds and short plant with round seeds) were also obtained in the ratio of 9 : 3 : 3 : 1. It is called **dihybrid ratio**.
- The tall/short trait and round wrinkled traits are independently inherited.

- The expression of a particular trait is controlled by gene.
- Plants have hormones that can trigger growth, *e.g.* Plant height can depend on the amount of a particular hormone. The amount of that hormone will depend on the efficiency of the process of making it.
- The characteristics or traits of parents are transmitted to their progeny through genes present on their chromosomes during the process of sexual reproduction.

SEX DETERMINATION

Sex determination is a biological system that determines the development of sexual characters in an organism.

- Different organisms use different strategies to determine the sex of new born.
- In some animals, the temperature at which fertilised eggs are kept determines whether the animals developing in the eggs will be male or female.
- In **snails**, individuals can change sex, indicating that sex is not genetically determined.
- In **human beings** the sex of an individual is genetically determined.
- All human chromosomes are not paired. 22 pairs are called **autosomes**. Women have a perfect pair of sex chromosomes XX. But men have a mismatched pair XY.
- Given figure shows all children will inherit an X chromosome from their mother. The sex of children will be determined by what they inherit from their father.
- A child who inherits an X chromosome from father will be a girl and one who inherits a Y chromosome will be a boy.



Sex determination in human beings

EVOLUTION

It is the sequence of gradual changes which take place in the primitive organisms over millions of years in which new species are produced.

- **The evidences of evolution are :**
  (i) **Homologous organs :** The organs which have same fundamental structure but different functions are called **homologous organs**. The examples are forelimb of frog, lizard, pigeon, mole, bat and humans have the same basic structural plan.
  (ii) **Analogous organs :** The organs which have similar functions but are different in their structural detail and origin are **analogous organs**. *E.g.* wings of insect and wings of bird. The organ which are present in reduced form and do not perform any function in the body but correspond to the fully developed functional organs of related animals called **vestigial organs** *E.g.* Muscles which are responsible for movement of ear are found in man but have lost their power to move the ear.
  (iii) **Fossils :** Fossils are the remains of the past and the study of fossils is known as **paleontology**.

Theories of Evolution

1. **Jean Baptiste Lamarck** gave the first theory of evolution.

2. **Darwin's Theory of Evolution**

Charles Robert Darwin (1809-1882) explained the evolutionary principle in his famous book "**The origin of species**". The theory proposed by him is popularly known as theory of **natural selection**.

- The main features of the theory of natural selection are as follows:
  (i) **Over production:** All organisms possess enormous fertility. They multiply in geometric ratio, *e.g.* plants produce thousands of seeds, insects lay hundreds of eggs, etc.
  (ii) **Limited food and space:** Despite of rapid multiplication of all types of species, food and space and other resources remain limited. They are not liable to increase.
  (iii) **Struggle for Existence:** It is the struggle between the individuals of the same or different species because their requirements like food, shelter, breeding places, etc are similar.
  (iv) **Variations:** Except the identical twins, no two individuals are similar and their requirements are also not exactly the same. It means there are differences among the individuals. These differences are called variations.
  (v) **Natural Selection or Survival of the Fittest:** The organisms which are provided with favourable variations would survive, because they are the fittest to face their surroundings while the unfit are destroyed. Originally it was an idea of **Herbert Spencer** (1820–1903) who used the phrase "**the survival of the fittest**" for the first time.
- Natural selection is the process of evolution of a species whereby characteristics which help individual organisms to survive and reproduce are passed on to their offsprings and those characteristics which do not help are not passed on.

Acquired trait : A trait (characteristics) of an organism which is 'not inherited' but develops in response to the environment is called an acquired

trait *e.g.* muscular body of an athlete, learning of music.

Inherited trait : A characteristic of an organism which is caused by a change in its genes is called an inherited trait.

e.g. fused and free ear lobes.

- **Speciation**

The process by which new species develop from the existing species is known as speciation.

- **The important factors which could lead to the rise (or formation) of a new species are the following :**

(i) **Geographical isolation** of a population caused by various types of barriers (such as mountain ranges, rivers and sea). The geographical isolation leads to reproductive isolation due to which there is no flow of genes between separated groups of population.

(ii) **Genetic drift** caused by drastic changes in the frequencies of particular genes is by chance alone.

(iii) **Variations** caused in individuals due to natural selection.

Speciation is of two types, **Allopatric speciation** is formation of new species from populations occurring in different and mutually exclusive areas of distribution. **Sympatric speciation** is development of new species from a segment of population in the same area due to some intrinsic factors like mutations.

EVOLUTION AND CLASSIFICATION

(i) We can classify the organisms by studying their evolutionary relationships.

(ii) This can be done by identifying hierarchies of characteristics between them.

(iii) Characteristics are details of appearance or behaviour of an organism.

(iv) The more characteristics two species will have in common, the more closely they are related and have a common ancestor.

- **Evolutions are of three types :-**

(i) Convergent Evolution

(ii) Divergent Evolution, and
(iii) Parallel Evolution.

Fossils

(i) The remains of dead plants or animals that lived in the remote past are known as **fossils**.
(ii) Various kinds of fossils are : -
Ammonite, Trilobite and Dinosaur.
(iii) The age of fossils can be detected. The most appropriate method is by detecting the ratios of different isotopes of the same element in the fossil material.

Evolution by Stages

(i) Evolution of complex organs have taken place bit-by-bit over generations. *e.g.* eye, feathers of birds have evolved because of survival advantage of intermediate stages.
(ii) Man had cultivated wild cabbage as a food plant and generated different vegetables like kohlrabi, kale, cauliflower, broccoli, red cabbage from it through artificial selection.
(iii) Thus changes in DNA during reproduction are the main cause of evolution.

Human Evolution

(i) All human beings belong to single speceis *Homo sapiens*, although there were many races of humans.
(ii) They have originated in Africa, some ancestors left Africa and migrated to West Asia, Central Asia, Eurasia, South Asia, East Asia, Indonesia, Australia, America, while others stayed there.
(iii) Excavating, time-dating, studying fossils and determining DNA Sequences have been used for studying human evolution.

Exercise

DIRECTIONS : This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which only one is correct.

1. Selection of variants by environmental factors
   (a) forms the basis of evolutionary processes
   (b) forms the basis of reproduction
   (c) cause inheritance of traits
   (d) have different kind of advantages
2. The rules of heredity determine the process by which _____ and _____ are reliably inherited.
   (a) shape and size
   (b) traits and characteristics
   (c) Both (a) and (b)
   (d) Neither (a) nor (b)
3. Plants having similar genotypes produced by plant breeding are called
   (a) clone
   (b) haploid
   (c) autopolyploid
   (d) genome
4. Mendel's law of segregation is based on separation of alleles during
   (a) gametes formation
   (b) seed formation
   (c) pollination
   (d) embryonic development
5. Disease resistant varieties can be produced by
   (a) crossing a plant with wild variety
   (b) treating with colchicine
   (c) crossing with hormones
   (d) treating with low temperature
6. According to Mendel's laws of inheritance
   (a) traits in human beings are related to the fact that both the parents have contributed practically amount of genetic material to the child.
   (b) each trait will be influenced by both maternal and paternal DNA.
   (c) for each trait there will be two versions in each child.
   (d) all these three statements describe the law of inheritance.

7. _____ is a section of cellular DNA that provides information for one protein.
   (a) Progeny
   (b) Traits
   (c) Gene
   (d) Hormone
8. A pure tall plant can be differentiated from a hybrid tall plant
   (a) by measuring length of plant
   (b) by spraying gibberellins
   (c) if all plants are tall after self-pollination
   (d) if all plants are dwarf after self-pollination
9. In animals sex determination is due to
   (a) X-chromosome
   (b) Y-chromosome
   (c) A-chromosome
   (d) B-chromosome
10. The famous book "Origin of species" was written by Charles Darwin in
   (a) 1809
   (b) 1859
   (c) 1885
   (d) 1871
11. In a Mendelian experiment tall plants bearing violet flowers were bred with short pea plants bearing white flowers. The progeny all bore violet flowers but almost half of them were short. The genetic make-up of the tall parent would have been
   (a) TtWw
   (b) TtWW
   (c) TTww
   (d) TTWW
12. A gene has two separate independent pieces, each called chromosome. Each cell will have two copies of each chromosome
   (a) one each from the male and female parents
   (b) both from the male parent
   (c) both from the female parent
   (d) both different from those of the parents
13. The term evolution in biology means that
   (a) fossils are old
   (b) life began in sea

(c) living things constantly change
(d) life began on land

14. Homolgous structures have
(a) similar origin but disimilar functions
(b) dissimilar origin but similar functions
(c) dissimilar origin but dissimilar functions
(d) dissimilar origin but dissimilar structures

15. The idea of "Survival of fittest" was given by
(a) Darwin
(b) Herbert Spencer
(c) Mendel
(d) Lamarck

16. Choose the odd one out
(a) Colour variation takes place during reproduction only
(b) Sexually reproducing individuals have two copies of genes for the same trait.
(c) If the copies are not identical, the trait that gets expressed is called the dominant trait.
(d) The trait that does not get expressed is called the recessive trait.

17. In human beings, the sex of the child depends on whether
(a) The paternal chromosome is X (for girls) or Y (for boys)
(b) The paternal chromosome is Y (for girls) or X (for boys)
(c) The maternal chromosome is X (for girls) or Y (for boys)
(d) The maternal chromosome is Y (for girls) or X (for boys)

18. Which one is not a vestigial organ in man ?
(a) Vermiform appendix
(b) Plica seminuralis
(c) Ear muscles
(d) Epiglottis

19. When an organ is used it will develop and if it is not used, it weakens to become vestigial. Who could have said this theory ?
(a) Darwin
(b) Hugo de-Vries

(c) Lamarck
(d) Mendel

20. An experiment to prove that organic compounds were the basis of life, was performed by
(a) Oparin
(b) Miller
(c) Melvin
(d) Fox

21. There is a tendency of variation during reproduction because of
(a) errors in DNA copying
(b) sexual reproduction
(c) Both (a) or (b)
(d) Neither (a) nor (b)

22. Evolution takes place because of
(a) natural Selection resulting in adaptation to fit environment better.
(b) genetic Drift providing diversity without adaptation.
(c) both natural selection and genetic drift.
(d) experiences of daily life.

23. According to the Neo-Darwinian theory which of the following is responsible for the origin of new species ?
(a) Mutations
(b) Useful variations
(c) Mutations together with natural selection
(d) Hybrdization

24. Nucleoprotein gave most probably the first sign of
(a) life
(b) amino acid
(c) soil
(d) sugar

25. Origin of life is due to
(a) spontaneous generation
(b) will to God
(c) effect of sun rays on mud
(d) None of the above

26. The changes in non-reproductive tissues
(a) cannot be passed on to the DNA of the germ cells

(b) cannot direct evolution
(c) are the acquired traits
(d) All of these

27. Variation combined with geographical isolation result in
(a) speciation
(b) dominant traits
(c) recessive traits
(d) None of these

28. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant, (rr YY) the seeds produced in F_1 generation are
(a) round and yellow
(b) round and green
(c) wrinkled and green
(d) wrinkled and yellow

29. In human males all the chromosomes are paired perfectly except one. This/these unpaired chromosomes is/are
(i) large chromosome
(ii) small chromosome
(iii) Y-chromosome
(iv) X-chromosome
(a) (i) and (ii)
(b) (iii) only
(c) (iii) and (iv)
(d) (ii) and (iv)

30. New species may be formed if
(i) DNA undergoes significant changes in germ cells
(ii) chromosome number changes in the gamete
(iii) there is no change in the genetic material
(iv) mating does not take place
(a) (i) and (ii)
(b) (i) and (iii)
(c) (ii), (iii) and (iv)
(d) (i), (ii) and (iii)

31. Characteristics
(a) decide more fundamental differences among organisms.
(b) are details of appearance - particular form.

(c) are details of behaviour - particular function.
(d) are details of particular form or function that decide more fundamental differences than less basic differences.

32. Classification of species is done on the basis of
(a) cell design - nucleated or non-nucleated
(b) unicellular or multi-cellular.
(c) specialisation of cell types and tissues - Autotrophs or heterotrophs.
(d) some other factors also in addition to these.

33. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F_1 progeny that have round, yellow (RrYy) seeds. When F_1 plants are selfed, the F_2 progeny will have new combination of characters. Choose the new combination from the following
(i) Round, yellow
(ii) Round, green
(iii) Wrinkled, yellow
(iv) Wrinkled, green
(a) (i) and (ii)
(b) (i) and (iv)
(c) (ii) and (iii)
(d) (i), (i) and (iii)

34. Select the statements that describe characteristics of genes
(i) Genes are specific sequence of bases in a DNA molecule.
(ii) A gene does not code for proteins
(iii) In individuals of a given species, a specific gene is located on a particular chromosome.
(iv) Each chromosome has only one gene.
(a) (i) and (ii)
(b) (i) and (iii)
(c) (i) and (iv)
(d) (ii) and (iv)

35. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F_2 is
(a) 1 : 3
(b) 3 : 1
(c) 1 : 1
(d) 2 : 1

36. Evolutionary relationships can be followed by
    (a) similar homologous characteristics indicate common origins even in apparently different species.
    (b) similar analogous characteristics may not have common origins
    (c) Both (a) and (b)
    (d) None of these
37. Age of a fossil can be estimated by
    (a) how closer to earth surface the fossil was found
    (b) detecting the ratio of different isotopes of the same element in the fossil
    (c) comparing DNA of different species
    (d) All of these
38. Some dinosaurs had feathers although they could not fly but birds have feathers that help them to fly. In the context of evolution this means that
    (a) reptiles have evolved from birds.
    (b) there is no evolutionary connection between reptiles and birds.
    (c) feathers are homologous structures in both the organisms.
    (d) birds have evolved from reptiles.
39. Genetics is the study of
    (a) inheritance
    (b) cell structure
    (c) only plants
    (d) only animals
40. If two parents have the genotypes AA × aa, the probability of having an aa genotype in the F_1 generation is
    (a) 25 percent
    (b) 50 percent
    (c) 75 percent
    (d) None of the above
41. A heterozygous red-eyed female Drosophila mated with a white-eyed male would produce
    (a) red-eyed females and white-eyed males in the F_1
    (b) white-eyed females and red-eyed males in the F_1
    (c) half red and half white-eyed females and all white eyed males in the F_1

(d) half red and half white-eyed females as well as males in the F_1

42. Complex organs may have evolved because of
(a) survival advantage of even the intermediate stages
(b) human intervention
(c) environmental changes
(d) competition among the same species

43. Newly generated species
(a) eliminate the existing species
(b) will have more complex body designs than the older ones
(c) are formed because of natural selection and genetic drift
(d) Both (b) and (c)

44. Which of the following would stop evolution by natural selection from occurring?
(a) If humans became extinct because of a disease epidemic.
(b) If a thermonuclear war killed most living organisms and changed the environment drastically.
(c) If ozone depletion led to increased ultraviolet radiation, which caused many new mutations.
(d) If all individuals in a population were genetically identical, and there was no genetic recombination, sexual reproduction, or mutation.

45. Which of the following rediscovered the Mendel's work?
(a) Correns
(b) Hugo de-Vries
(c) Tschermark
(d) all of the above

46. From heredity point of view which marriage is not suitable ?
(a) Man Rh (–) and Woman Rh (+)
(b) Both Rh (+)
(c) Both Rh (–)
(d) Man Rh (+) and Woman Rh (–)

47. Palaentology is the study of
(a) fossils
(b) bones
(c) birds
(d) embryo

48. The generation of diversity and the shaping of diversity by environmental selection are

(a) evolution
(b) diversity
(c) heredity
(d) All of these

49. Study of evolution of human beings indicates that
(a) all humans belong to a single species that evolved in Africa and spread across the world in stages.
(b) the difference in colour, size and looks is the result of environmental changes
(c) Both (a) and (b)
(d) None of these

50. Which of the following statement(s) is/are incorrect regarding formation of newspecies?
(i) DNA undergoes significant changes in germ cells
(ii) Chromosome number changes in the gamete
(iii) There is no change in the genetic material
(iv) Mating does not take place
(a) (i) and (ii)
(b) (i) and (iii)
(c) (ii), (iii) and (iv)
(d) (iii) and (iv)

51. Which one of the following has four limbs with similar basic structure as the mammals?
(a) Birds
(b) Reptiles
(c) Amphibians
(d) All the three

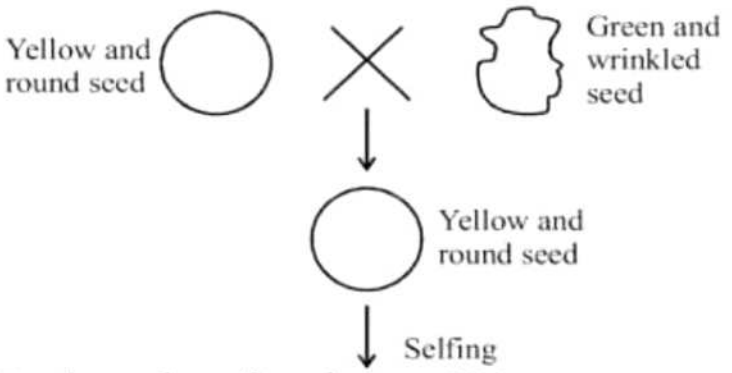
52. Birds and bats have wings, but they do not have common origin because
(a) wings of bats are skin-fold stretched mainly between elongated fingers, but the wings of birds are a feathery covering all along the arm.
(b) structure and components of their wings are very different.
(c) they look similar because they have a common use.
(d) All of these.

53. Which one of the following does not describe formation of fossils?
(a) Extinct species must have existed at some stage.
(b) Bodies of organisms will decompose and be lost after their death.

(c) Some part of the environment does not let the body or a part of it to decompose completely.

(d) An impression of the body parts may be left on the immediate surroundings for ever.

54.



Total number of seeds were 556.

Yellow round = a, Yellow wrinkled = b, Green round = c, Green wrinkled = d

Choose the correct option :

(a) a = 32, b = 108, c = 101, d = 315

(b) a = 108, b = 315, c = 32, d = 101

(c) a = 315, b = 101, c = 108, d = 32

(d) Can't say

55. A mendelian experiment consisted of crossing tall pea plants bearing red flowers, with short pea plants, bearing white flowers. All plants of F_1 generation consists of tall with red flowers. Then the genetic make up of the tall parents can be defined as :

(a) TTWW

(b) TTww

(c) TtWW

(d) TtWw

56. Simplest life forms inhabiting adverse habitats are

(a) humans

(b) bacteria

(c) plants

(d) vultures

57. A change that is useful for one property

(a) can become useful later for quite a different function.

(b) can be used for performing the same function.

(c) can perform some other function also without abandoning the original use.

(d) All of these

Hints & SOLUTIONS

1. **(a)** Variants by environmental factors like temperature form the basis of evolutionary processes.
2. **(b)** Reproductive processes generate individuals of similar design so, the rules of heredity determine the process by which traits and characteristics are reliably inherited.
3. **(a)**
4. **(a)**
5. **(a)**
6. **(d)** Mendel proposed the laws of inheritance based on experiments conducted on pea plants.
7. **(c)** Gene is a section of cellular DNA that provides information for one protein.
8. **(c)**
9. **(b)**
10. **(b)**
11. **(b)** Genetic make up of the progeny is decided on the basis of the dominant and recessive traits of the parents. The genetic make-up of the tall parent would have been TtWW.
12. **(a)** A gene has two separate independent chromosome. Each cell will have two copies of each chromosome one each from the male and female parents.
13. **(c)**
14. **(a)**
15. **(a)**
16. **(a)** Colour variation can take place due to environment as well.
17. **(a)** In human beings, males have XY chromosomes and females have XX chromosomes.
18. **(d)**
19. **(c)**
20. **(b)**
21. **(c)** Number of variations are maximised by the process of sexual reproduction. During reproduction copy of DNA takes place. But the exact copy of DNA doesn't. Therefore, we see variations in different species.
22. **(c)**
23. **(c)**
24. **(a)**
25. **(d)**
26. **(d)** The changes in non-reproductive tissues are the acquired traits and these cannot be passed on to the DNA of the germ cells.

27. **(a)** Speciation takes place on the basis of variation combined with geographical isolation.
28. **(a)**
29. **(c)**
30. **(a)**
31. **(d)** Characteristics are details of appearance or behaviour.
32. **(d)** Classification of species is done on the basis of cell design, specialisation of cell types and tissues and evolutionary relationship.
33. **(b)**
34. **(b)**
35. **(c)**
36. **(c)** Similar homologous characteristics indicate common origins even in apparently different species whereas similar analogous characteristics may not have common origins.
37. **(d)** Age of a fossil can be estimated by guessing how closer it was to earth surface when found, by isotope dating or by comparing DNA of different species.
38. **(d)**
39. **(a)**
40. **(d)**
41. **(d)**
42. **(a)** Complex organ may have evolved because it had survival advantage at intermediate stages.
43. **(d)** Because of natural selection and genetic drift, newly generated species are found to have more complex designs, though original species might not have vanished completely.
44. **(d)**
45. **(d)**
46. **(d)**
47. **(a)**
48. **(a)** Evolution can be described as generation and shaping of diversity by environmental selection.
49. **(c)** Study of evolution of human beings indicates that all humans originated from a single species that evolved in Africa. Spreading across the world in stages with wide variations in environment and climate made the difference in colour, size and looks.
50. **(d)**
51. **(d)** Basic structure of four limbs of birds, reptiles or amphibians is similar to that of the mammals.
52. **(d)** Structure and components of wings are different, but look similar for their common function.

53. **(a)** Extinct species must have existed at some stage describe evolution.

54. **(c)**

55. **(a)**

56. **(b)** Bacteria have survived adverse habitats.

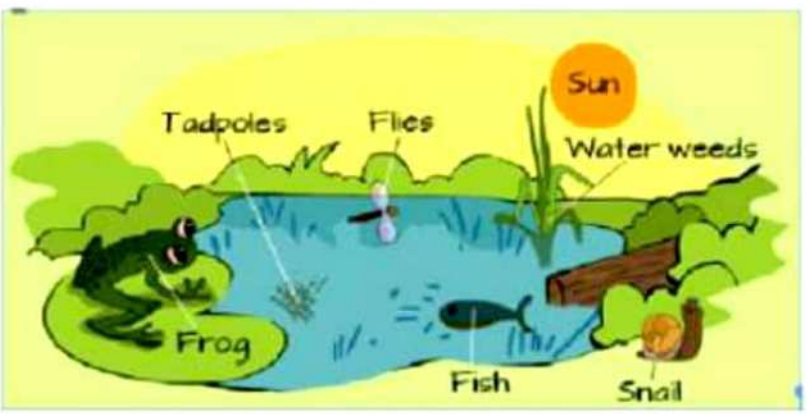
57. **(a)** Becoming useful later for quite a different function than abandoning is a welcome change.

Chapter 5 Ecology & Environment

BIOSPHERE

Biosphere is the layer of the planet Earth where life exists.
This layer ranges from heights of up to ten kilometers above the sea level.
Biosphere is an ecological system integrating all living beings and their relationship including their interaction with the elements of the lithosphere, hydrosphere and atmosphere.

ECOSYSTEM



Pond Ecosystem

Ecosystem is defined as a specific and recognizable landscape such as forest, wetland, coastal area, grasslands, deserts, etc. having interaction of biological community and physical and chemical factors that is made up of non-living or abiotic environment.

Aquatic Ecosystem

- The aquatic ecosystem has been classified in a number of ecological ways.
- On the basis of salt content in water they are further divided into fresh water, estuarine and marine ecosystem.

Terrestrial Ecosystem