

QB365
Model Question Paper - 2
12th Standard CBSE

Biology

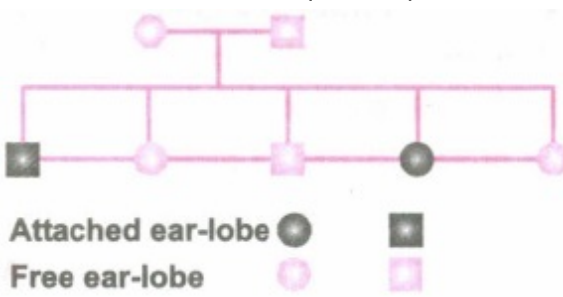
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Time : 02:00:00 Hrs

Total Marks : 100

Section - A

- 1) Heterozygous purple flower is crossed with recessive white flower. The progeny has the ratio : 1
(a) 75% purple and 25% white (b) 50% purple and 50% white (c) All purple (d) All white
- 2) Given below is a pedigree chart of a family with five children. It shows the inheritance of attached ear lobes as opposed to the free ones. The squares represent the male individuals and circles the female individuals. 1
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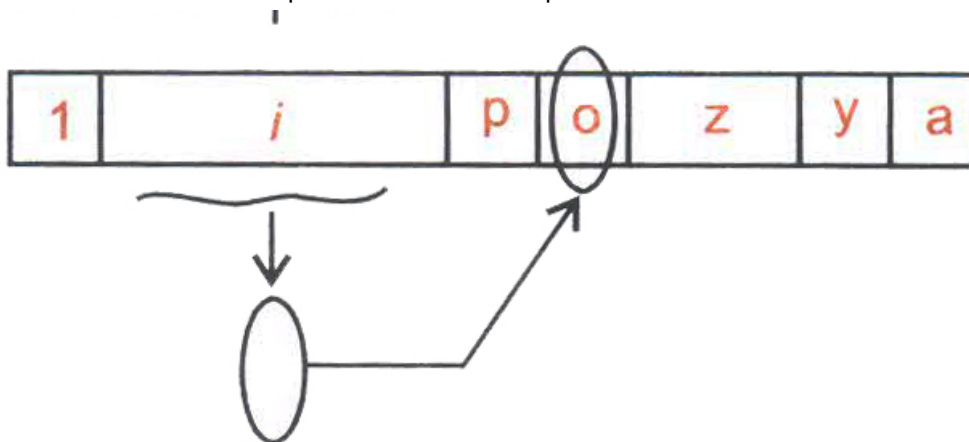
Attached ear-lobe ●
Free ear-lobe ○
- Which one of the following conclusions drawn is correct?
- (a) The parents are homozygous recessive (b) The trait is Y-linked
(c) The parents are homozygous dominant (d) The parents are heterozygous
- 3) Crossing over in diploid organisms results in 1
(a) Recombination of linked genes (b) Segregation of alleles (c) Independent assortment
(d) Dominance of genes
- 4) When a cluster of genes show linkage behaviour they 1
(a) Do not show independent assortment (b) Do not show a chromosome map
(c) Show recombination during meiosis (d) Induce cell division
- 5) In pea plants, yellow seeds are dominant to green. If heterozygous yellow seeded plant is crossed with a green seeded plant, what ratio of yellow and green seeded plants would you expect in F_1 generation? 1
(a) 9 : 1 (b) 1 : 3 (c) 3 : 1 (d) 50 : 50
- 6) When a tall plant with round seeds (TTRR) crossed with a dwarf plant with wrinkle seeds (ttrr), the F_1 generation consists of tall plants with round seeds. What would be the proportion of dwarf plant with wrinkle seeds in F_1 generation? 1
(a) $\frac{1}{4}$ (b) $\frac{1}{16}$ (c) 0 (d) $\frac{1}{4}$

- 7) Sickle-cell anaemia is 1
- (a) Caused by substitution of valine by glutamic acid in the beta globin chain of haemoglobin.
(b) Caused by a change in a single base pair of DNA.
(c) Characterized by elongated sickle like RBCs with a nucleus. (d) An autosomal linked dominant trait.
- 8) Select the incorrect statement from the following : 1
- (a) Galactosemia is an inborn error of metabolism.
(b) small population size result in random genetic drift in a population. (c) Baldness is a sex-linked trait.
(d) Linkage is an exception to the principle of independent assortment in heredity.
- 9) Hargobind Khorana got Nobel Prize for 1
- (a) Gene synthesis (b) Determining genetic code (c) Producing disease resistant maize
(d) Discovery of transposons
- 10) The correctly matched pair is 1
- (a) Okazaki fragments-splicing (b) RNA polymerase-RNA primer (c) Central dogma_codon
(d) Restriction endonuclease-genetic engineering
- 11) A gene of operon which synthesizes a repressor protein is 1
- (a) regulator gene (b) operator gene (c) structural gene (d) promotor gene
- 12) Meselson and Stahl experiment proved 1
- (a) DNA is genetic material (b) Central dogma (c) Transformation
(d) Semi conservative DNA replication (e) Transduction
- 13) A baby has been born with a small tail. It is a case exhibiting 1
- (a) retrogressive evolution (b) mutation (c) atavism (d) metamorphosis
- 14) 3-5 billion years ago, which flora dominated the earth? 1
- (a) Archaeobacteria (b) Mosses (c) Lichens (d) Blue-green algae
- 15) A living connecting link which provides evidences for organic evolution is 1
- (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
- 16) In order to obtain disease-free plants through tissue culture techniques, the best method is 1
- (a) Embryo rescue (b) Anther culture (c) Protoplast culture (d) Meristem culture
- 17) The best way to obtain bacteria and viruses free plants through tissue culture 1
- (a) Micropropagation (b) Seed germination after gamma-irradiation (c) Stem or Shoot tip culture
(d) Seed germination under aseptic conditions
- 18) In tissue cultural medium, the embryoids formed from pollen grains is due to 1
- (a) Cellular totipotency (b) Organogenesis (c) Double fertilization (d) Test tube culture
- 19) Pure line breeds refer to 1
- (a) Homozygosity and independent assortment (b) Homozygosity only (c) Homozygosity
(d) Homozygosity and linkage

- 20) India's wheat yield revolution in the 1960s was possible primarily due to 1
- (a) Increased chlorophyll content (b) Mutations resulting in plant height reduction
- (c) Quantitative trait mutations (d) Hybrid seeds

Section - B

- 21) Inheritance is particulate in nature. Why? 2
- 22) In a certain mammal, erect ears are dominant over drooping ears. In a cross between the two types, out of the four offspring produced in F_2 generation, three had erect ears and one had drooping ears. What were the genotypes of the parents? (You may represent the dominant gene as E.) 2
- 23) Give one function each of histone protein and non-histone chromosomal protein in an eukaryotic cell. 2
- 24) Compare the roles of the enzymes DNA-polymerase and DNA-ligase in the replication fork of DNA. 2
- 25) Life originated from the earth's inorganic atmosphere in the past, but this no longer happens today. Give two reasons 2
- 26) Name the largest of the dinosaurs and mention two of its features. 2
- 27) The steps in a programme are: - Collection of germplasm - Crossbreeding the selected parents - Testing, releasing and marking new cultivars. (i) What is this programme related to? (ii) Name two special qualities as basis of selection of the progeny (iv) What is the popular term given to this outcome? Also name the indian scientist who is credited with chalking out of this programme. 2
- 28) What are the advantages of breeding for disease - resistance in plants? 2
- 29) (a) Sickle-celled anaemia in humans is a result of point mutation. Explain. (b) Write the genotypes of both the parents who have produced a sickled-celled anaemiv offspring. 2
- 30) Identify given reasons that salient features of genetic code by studying the following nucleotide sequence of mRNA strand and the polypeptide translated from it AUG UUU UCU UUU UUU UCU UAG Met -Phe -Ser -Phe -Phe -Ser 2
- 31) Describe the initiation process o transcription in bacteria. 2
- 32) Given below is a schematic representation of a lac operon: 2



(a) Identify i

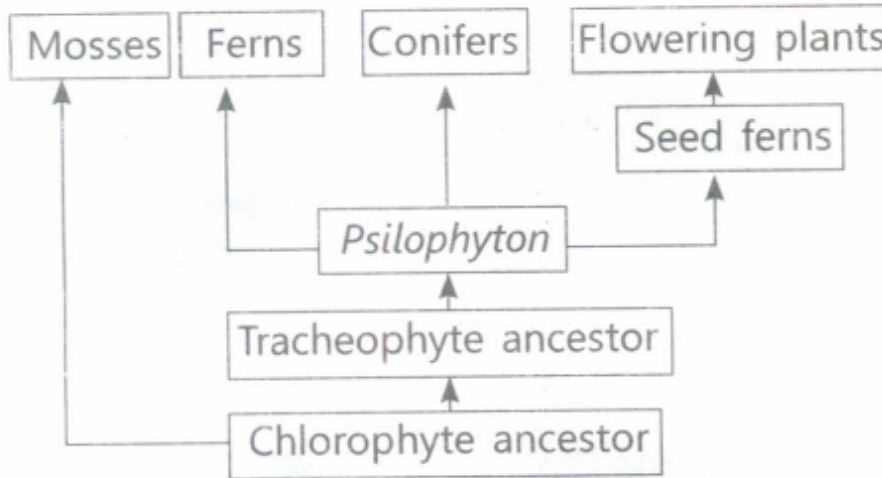
and p. (b) NAME the 'inducer' for this operon and explain its role.

- 33) What are the following of mRNA and tRNA? What anticodons will be required to recognize the following codons? 2
- (i) AAU
(ii) CGA
(iii) UAC
(iv) GCA

34) Anthropogenic action can hasten evolution. Explain with the help of a suitable example. 2

35) Discovery of lobefins is considered very significant by evolutionary biologists. Explain. 2

36) Study the schematic representation of evolutionary history of plant forms given below and mention: 2



(a) The plant form ferns

and conifers are most related to.

(b) The nearest ancestors of flowering plants.

(c) The most primitive group of plants.

(d) Common ancestry of psilophyton provides to.

(e) The common ancestry of psilophyton and seed ferns.

(f) The common ancestors of mosses and tracheophytes.

37) Gene flow occurs through generations. Gene flow can occur across language barriers in humans. If we have a technique of measuring specific allele frequencies in different population of the world, can we not predict human migratory patterns in pre-history and history? Do you agree or disagree? Provide explanation to your answer. 2

38) (a) What is the programme called, that is involved in improving success rate of production of desired hybrid and herd size of cattle? (b) Explain the method used for carrying this programme for cows. 2

39) Plant breeding technique has helped sugar undergrowth in North India? Explain. 2

- 40) Some crop varieties bred by hybridisation and selection for disease resistance to fungi, bacteria, and viral disease are released. Complete the following table 2

Crop	Variety	Resistance to diseases
Wheat	A	Leaf and strip rust Hill bunt
Brassica	Pusa Swarnim	B
Cauliflower	C	D
Cow pea	E	Bacterial blight
Chilli	F	Chilli mosaic virus, Tobacco mosaic virus and leaf curl.

Section - C

- 41) What exactly is dominance? Why are some alleles dominant and some recessive? 5
- 42) (i)What are the three types of RNA? (ii)Which one of these has the shape of a clover leaf in two-dimensional structure? (iii)How is each RNA related in the information during protein synthesis?Explain. 5
- 43) Describe the steps involved in the sequencing of genome of an organism. 5
- 44) Enumerate the salient features of human genome. 5
- 45) How did Louis Pasteur successfully demolish the popular theory of spontaneous generation? What were his conclusions? 5
- 46) Define the following: 5
- (i) Gene flow
 - (ii) Industrial melanism
 - (iii) Allopatric speciation
 - (iv) Sympatric speciation
 - (v) Balancing selection
 - (vi) Hybrid sterility
 - (vii) Biological species concept
 - (viii) Evolutionary species concept.
- 47) Enumerate the points that have to be considered for successful bee-keeping. 5
- 48) How are morphological and biochemical/physiological characteristics of plants associated with resistance to insect pests? Give any five examples of the features and the name of the pest, which each is resistant to. 5

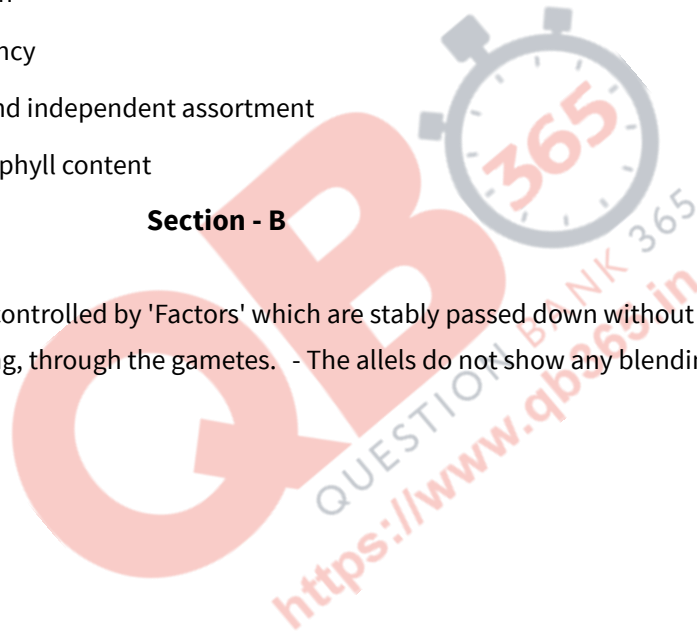
Section - A

- 1) (b) 50% purple and 50% white 1
- 2) (d) The parents are heterozygous 1
- 3) (a) Recombination of linked genes 1
- 4) (a) Do not show independent assortment 1
- 5) (d) 50 : 50 1
- 6) (c) 0 1
- 7) (b) Caused by a change in a single base pair of DNA. 1

- 8) (c) Baldness is a sex-linked trait. 1
- 9) (a) Gene synthesis 1
- 10) (d) Restriction endonuclease-genetic engineering 1
- 11) (a) regulator gene 1
- 12) (d) Semi conservative DNA replication 1
- 13) (c) atavism 1
- 14) (d) Blue-green algae 1
- 15) (d) duck-billed platypus between reptiles and mammals 1
- 16) (d) Meristem culture 1
- 17) (a) Micropropagation 1
- 18) (a) Cellular totipotency 1
- 19) (a) Homozygosity and independent assortment 1
- 20) (a) Increased chlorophyll content 1

Section - B

- 21) 2
- The characters are controlled by 'Factors' which are stably passed down without any change from the parents to the offspring, through the gametes. - The alleles do not show any blending.

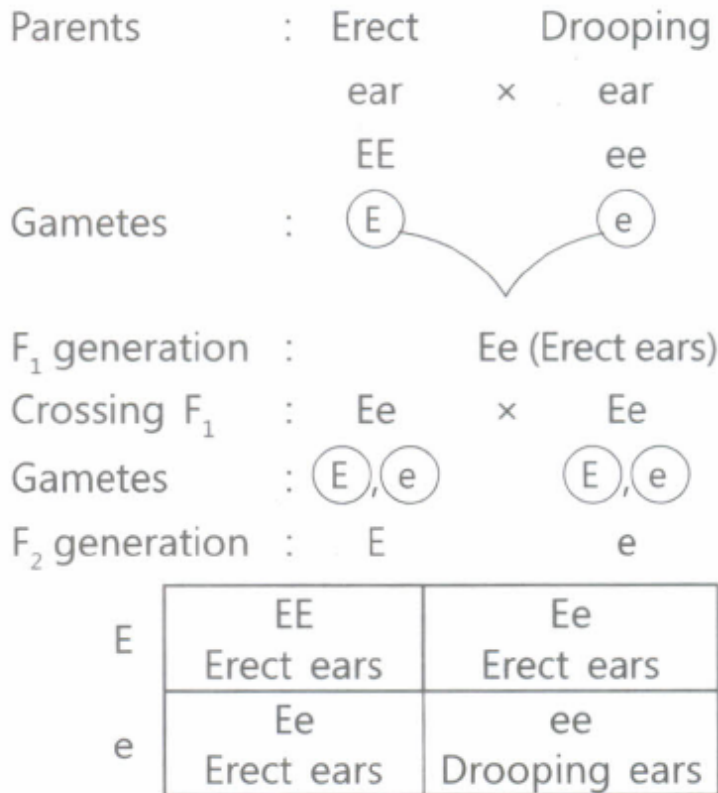


22)

2

Since drooping ears, the recessive trait has appeared in the progeny, both the parents must be heterozygous, i.e. Ee.

- These individuals (with genotype, Ee) are produced by a cross between parents of the two types i.e. with erect ears and drooping ears; so both the parents must be homozygous, i.e. EE and ee.



The phenotypic ratio is 3 Erect ears : 1 Drooping ears.

23)

2

-Histone proteins help in packaging the giant molecules of DNA into nucleosomes to be accommodated into the nucleus -Non-histone chromosomal proteins help in packaging of chromatin at higher levels.

24)

2

-The enzyme DNA polymerase polymerises the nucleotides in the 5' → 3' direction in both continuous and discontinuous synthesis. -The enzyme DNA-ligase joins the short stretches of DNA of discontinuous synthesis.

25)

2

Life does not originate today because: (i) The atmosphere of the present day is an oxidising one and any molecule synthesised is oxidised. (ii) Other organisms devour any molecule formed.

26)

2

Tyrannosaurus rex was the largest of the dinosaurs. (i) It was about 20-feet in height. (ii) It had huge fearsome dagger-like teeth.

27)

2

(i) Plant breeding / Raising of new varieties of a crop (ii) High yield, disease resistance, semi dwarfness, high protein content. (iii) New hybrid varieties of plants have been produced, and there is an increased yield. (iv) Green revolution M.S. Swaminathan

28)

2

(i) Enhanced production by reducing losses due to diseases. (ii) Reduced dependence on the use of fungicides and bactericides (thereby pollution of soil is prevented).

29)

2

(a) Mutation arising due to a change in a single base pair of DNA, is called point mutation.

- The defect is caused by the single base substitution at the sixth codon of the beta chain of haemoglobin from GAG to GUG; this leads to substitution of glutamic acid by valine.

- The mutant or defective hemoglobin molecule undergoes polymerization under low oxygen tension causing sickle-shaped RBCs.

(b) The parents must be $Hb^A Hb^s$

30)

2

(i) UAA does not code for any amino acid; it is a termination codon.

(ii) Genetic code is specific and unambiguous, i.e. one codon codes for a particular amino acid only.

(iii) Genetic code is degenerate, as one amino acid is coded by more than one codon, e.g. UUU and UUC code for phenylalanine.

(iv) Genetic code is read in a contiguous manner without any punctuation (any three) AUG has a dual function; it is initiation codon as well as codes for methionine.

31)

2

Initiation process of transcription in bacteria:

- The RNA polymerase binds transiently to an initiation factor (Sigma σ factor) and binds to a specific sequence on the DNA, called promoter, to initiate transcription.



- The DNA strand with 3' \rightarrow 5' polarity acts as the template.

32)

2

(a) i -Regulatory gene

p -Promotor gene.

(b) - Lactose is the inducer. Lactose on entering the cell binds to the repressor and inactivates it.

- Hence, the repressor cannot bind to the operator.

- This allows RNA polymerase to have access to the promoter and transcription proceeds, i.e. there is a positive regulation of the operon by lactose.

33)

2

mRNA carries a message from DNA to ribosome in the form of sequence of triplet codes. It acts as a platform where protein synthesis takes place. tRNA transfers amino acids to the protein synthesizing apparatus. mRNA possesses codons and tRNA possesses anticodons. The anticodons are---(i)UUA,(ii)GUC, (iii)AUA,(iv)CGU

34)

2

- Anthropogenic actions, i.e. human activities have been found to enhance evolution. e.g. 1. Use of DDT has resulted in evolution of DDT-resistant mosquitoes. 2. Evolution of antibiotic or drug-resistant microbes. - When DDT was used for the first time, many mosquitoes died, but a few survived. - These few mosquitoes showed resistance to DDT and reproduced in the presence of DDT. - Most of the offspring were also resistant to DDT. - Hence, the mosquito populations of today consist mainly of DDT-resistant mosquitoes and hence, DDT is not effective. - In the absence of DDT, these DDT-resistant mosquitoes had no advantage over those mosquitoes, which were sensitive to DDT. - This is an example of evolution due to anthropogenic activities.

35)

2

Lobefins are the fish with stout and strong fins, that could move on land and go back to water; they must have lived about 350 mya and were thought to be extinct. - In 1938, a Coelacanth (lobefin) was caught in South Africa. - Though no specimens of these are left with us, they evolved into the first amphibians. - These were the ancestors of modern-day frogs and salamanders.

36) (a) Psilophyton

2

(b) Seed ferns

(c) Chlorophyte ancestors

(d) Ferns,

Conifers, Seed ferns (e) Tracheophyte ancestors if Chlorophyte ancestors.

37)

2

Yes, we agree. As the gene flow occurs through geographical barriers over generations, by studying specific allelic frequencies in various populations of the world, we can predict the human migratory patterns in pre-historic and historic era.

There have been projects undertaken such as human genographics project. Which uses data from studies on specific genes/chromosomes/mitochondrial DNA to trace the evolutionary history and migratory patterns of humans.

38)

2

(a) Multiple ovulation Embryo Transfer, (MOET) technology

(b) Steps in MOET technology:

- A cow is administered hormones with FSH-like activity to induce follicular maturation and superovulation, i.e. instead of one egg, 6-8 eggs are produced per cycle.

- The animal is either mated with an elite bull or artificially inseminated.

- The fertilised eggs are recovered at the 8-32 celled stages, nonsurgically.

- They are then transferred to surrogate mothers.

- The genetic mother is available for and her round of superovulation.

39)

2

1. Sugarcane. grown in North India is *Saccharum barberi*. It has poor yield and poor sugar content.
2. Sugarcane grown in South India is *Saccharum officinarum*. It has Thicker stem and high sugar content. This species cannot be grown in North Indian conditions.
3. They were successfully cross by plant breeding to obtain hybrid varieties having following desirable characters:
 - (i) high yield
 - (ii) Thick stem
 - (iii) High sugar content
 - (iv) ability to grow in North-Indian conditions.

40)

2

- A. Himgiri B. White rust C. Pusa Shubhra, Pusa Snowball K-1 D. Black rot and curl light black rot E. Pusa Komal F. Pusa Sadabahar

Section - C

41)

5

Dominance:

- Every gene contains the information to express a particular trait.
- In a diploid organism, there are two alternate forms of a gene, or a pair of alleles.
- The two alleles may be similar (homo-zygous) or may be different (heterozygous).
- One of them may be different due to some changes that it has undergone, which modify the information of that particular allele.
- The phenotype will be dependent on the original unmodified allele.

42)

5

(i) The three types of RNA are

- (a) Messenger RNA (mRNA)
- (b) Transfer RNA (tRNA)
- (c) Ribosomal RNA (rRNA)

(ii) Transfer RNA has the shape of clover leaf in two dimensional structure.

(iii) Functions of RNAs

(a) Messenger RNA (mRNA)

- It brings the genetic information of DNA transcribed on it, to ribosomes for protein synthesis.
- It decides the sequence of amino acids in a polypeptide chain.

(b) Transfer RNA (tRNA)

- It acts as an adapter molecule, that reads the code on mRNA on one hand and binds to a specific amino acid on the other hand.

- By its anticodon, it recognises the codon and, leaves the amino acid coded by the mRNA at the site of protein synthesis.

(c) Ribosomal RNA (rRNA)

- It forms the structure of ribosomes.
- It also plays a catalytic role in the formation of peptide bond; 23S rRNA is ribozyme.

Sequencing of a Genome

- The methods involve two major approaches:

(i) One approach called Expressed Sequence Tags (ESTs), focuses on identifying all the genes that are expressed as RNAs.

(ii) Second approach called Sequence Annotation, is to simply sequence the whole set of genome, that includes all the coding and non-coding sequences and then assigning functions to different regions in the sequence.

- The total DNA from the cell is isolated and converted into random fragments of relatively smaller sizes.

- These fragments are then cloned in suitable hosts using specialised vectors; the commonly used hosts are bacteria and yeast and the vectors are bacterial artificial chromosomes (BAC) and yeast artificial chromosomes (YAC).

- The fragments are then sequenced using automated DNA sequences.

- The sequences are then arranged on the basis of certain overlapping regions present in them; this requires the generation of overlapping fragments for sequencing.

- Specialised computer programmes are developed for alignment of the sequences.

- These sequences are annotated and assigned to the respective chromosomes.

44)

5

Salient features of Human Genome

(i) The human genome contains 3164.7 million nucleotides (base pairs).

(ii) The size of the genes varies; an average gene consists of 3000 bases, while the largest gene, dystrophin consists of 2.4 million bases.

(iii) The total number of genes is estimated to be 30000 and 99.9% of the nucleotides are the same in all humans.

(iv) The functions of over 50% of the discovered genes are not known.

(v) Only less than 2% of the genome codes for proteins.

45)

5

(1) **Spontaneous** generation refers to origin of life from non-living substances like mud, rocks, decaying matter under conditions that now exist on the earth, whereas abiogenesis is the origin of life simple from non-living material under different set of conditions from those existed on the primitive earth.

(2) Theory of spontaneous generation was disapproved the finding. **"life comes from pre-existing life"**.

Francesco Redi (1668) placed thoroughly cooked meat in three jar-(i) uncovered (ii) covered with parchment and (iii) covered with muslin. Maggots developed only in the uncovered jar. No maggot developed in jar covered by parchment. Flies visited the third jar produced maggots. **Spallanzani** (1765) boiled nutrition broth in glass flasks, sealed the flasks and kept them. The broth remained clear indefinitely with no signs of living beings.

Pasteur (1864) took broth in flasks having swan necks, boiled and allowed the broth to cool. No germs developed in the broth though it was connected with the atmosphere through curved necks of the flasks. The dirt particles could not reach the broth because they got trapped in the bend of the neck. When the swan necks were broken, broth developed colonies of microorganisms, showing that the same have come from air. The theory of biogenesis is, however, not applicable to origin of life.

46)

5

(i) Gene flow: The transfer of gene in the hereditary from one generation to next is called gene flow.

(ii) Industrial melanism: Evolution of darker forms of in response to industrial population is known as industrial melanism.

(iii) Allopatric speciation: The speciation by the geographical separation of two population and divergence of the population.

(iv) Sympatric speciation: When a sub-population becomes reproductively isolated in the midst of its parent population this is called sympatric speciation.

(v) Balancing selection: By Heterozygous condition in the sickle cell anaemia(H^A/H^S) survived the malarial condition and balance the lost by sickle cell anaemia is called balancing selection.

(vi) Hybrid sterility: If the hybrid is sterile which is formed by postmating isolation mechanism.

(vii) Biological species concept: A sexually interbreeding population which is separated from other species by the reproductive isolation.

(viii) Evolutionary species concept: An evolutionary species is a lineage evolving separately from others with its own unitary role and tendencies.

47) Successful bee keeping

5

- It requires the following considerations:

- (i) Knowledge of the nature and habits of bees.
- (ii) Selection of suitable location of keeping beehives.
- (iii) Catching and hiving of swarms.
- (iv) Management of beehives at different seasons.
- (v) Handling and collection of honey and beeswax.

48)

5

Resistance to Insect Pests

- Resistance to insect pests is genetically controlled and manifested in the form of morphological, physiological or biochemical characteristics.

- A few examples are given below:

- (i) Wheat - Hairy leaves
 - Resistance to cereal leaf beetle.
- (ii) Maize - High aspartic acid and low nitrogen and sugar contents
 - Resistance to stem
- (iii) Wheat - Solid stem
 - Resistance to saw fly
- (iv) Cotton - Smooth leaves and nectarless condition.
 - Resistance to bollworm.
- (v) Cotton - Hairy leaves
 - Resistance to jassids