

Important Questions from the Previous Years' Board Papers
Unit: Genetics and Evolution
2011(Delhi Region)
Set 1

One mark Questions:

Q.7. Mention the role of the codons AUG and UGA during protein synthesis.

Answer: AUG is the start codon that initiates the protein synthesis. UGA is the stop codon that signals for the termination of protein synthesis.
(Chapter 6, Pg.112)

Two mark Questions:

Q.9. How do histones acquire positive charge?

Answer: Histones acquire positive charge due to presence of abundance of basic amino acid residues such as lysine and arginine that have positive side charges in their side chains.
(Chapter 6, Pg.no. 99)

Three mark Questions:

Q.20. How are dominance, co-dominance and incomplete dominance patterns of inheritance different from each other?

Answer: **Dominance:** A dominant factor or allele expresses itself in the presence or absence of a recessive trait. For example, tall plant, round seed, violet flower, etc. are dominant characters in a pea plant.

Co-dominance: Co-dominance is the phenomenon in which both the alleles of a contrasting character are expressed in heterozygous condition. Both the alleles of a gene are equally dominant. ABO blood group system is an example of co-dominance.

Incomplete dominance: Incomplete dominance is a phenomenon in which one allele shows incomplete dominance over the other member of the allelic pair for a character. For example, a monohybrid cross between the plants having red flowers and white flowers in *Antirrhinum* species will result in all pink flower plants in F₁ generation.

(Chapter 5, Pg.no. 97)

Q.21. The base sequence in one of the strands of DNA is TAGCATGAT.

- (i) Give the base sequence of its complementary strand.
- (ii) How are these base pairs held together in a DNA molecule?
- (iii) Explain the base complementarity rules. Name the scientist who framed this rule.

Answer: (i) The base sequence of the complementary strand will be ATCGTACTA.
(ii) The base pairs in the DNA molecules are held with hydrogen bonds. There are two hydrogen bonds between adenine and thymine and three hydrogen bonds between guanine and cytosine.
(iii) **Base Complementarity Rule:** A purine will always pair with a pyrimidine in a DNA molecule i.e. A will pair with T and G will pair with C. The ratio of A and T or C and G will always be 1. The base complementarity rule was put forth by Erwin Chargaff. (Chapter 6, Pg.no.97)

- Q.22.** (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 sickle-celled anaemic offspring.

Answer: (a) Sickle cell anaemia in humans is a result of point mutation because a single base change in the gene leads to the replacement of GAG by GUG. This leads to the substitution of the amino acid Glutamine (Glu) by Valine (Val) at sixth position of beta globin chain of haemoglobin.
 (b) Genotypes of parents who have produced a sickle celled anaemic offspring can be either HbA/ Hbs and HbA/ Hbs or Hbs/ Hbs and HbA/ Hbs
(Chapter 5, Pg.no 89)

Five mark Questions:

- Q.29.** Explain the salient features of Hugo de Vries theory of mutation. How is Darwin's theory of natural selection different from it? Explain.

Answer: Hugo de Vries based on his work on evening primrose suggested that variations occurred due to mutations. Hugo de Vries gave the name saltation (single step large mutation) to the mutations that brought about speciation. Darwin aboard the H.M.S Beagle observed that all existing living forms share similarities among themselves and also with other life forms that existed millions of years ago of which many are extinct. The evolution of life forms has been gradual and those life forms better fit in environments that leave more progeny. This is called natural selection and is a mechanism of evolution. Mutations are random and directionless while the variations that Darwin talked about were small and directional. **(Chapter 7, Pg.no. 134-135)**

- Q.29 (OR)**(a) Name the primates that lived about 15 million years ago. List their characteristic features.
 (b) (i) Where was the first man-like animal found?
 (ii) Write the order in which Neanderthals, Homo habilis and Homo erectus appeared on earth. State the brain capacity of each one of them.
 (iii) When did modern Homo sapiens appear on this planet?

Answer: (a) *Dryopithecus* (ape-like) and *Ramapithecus* (man-like) were the two primates that lived 15 million years ago. These primates were hairy and their walk was similar to that of chimpanzees.
 (b) (i) The first man-like animal was found in Africa.
 (ii)

Year	Evolution	Brain Capacity
2 million years ago	<i>Homo habilis</i> (<i>Australopithecines</i>) lived in East Africa	650 – 800 cc
1.5 million years ago	<i>Homo erectus</i>	900 cc
1,000 – 40,000 years ago	Neanderthal man	1400 cc

- (iii) Modern *Homo sapiens* first appeared primarily in east Africa about 75,000 to 10,000 years ago.
(Chapter 7, Pg.no. 141)

Set 3

Two mark Question:

Q. 9. State the dual role of deoxyribonucleoside triphosphates during DNA replication.

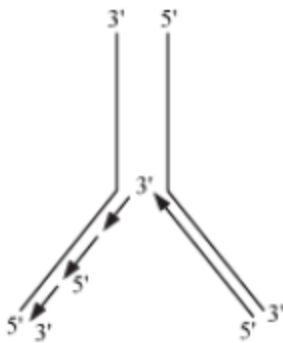
Answer: Deoxyribonucleoside triphosphates (DNTPs) have dual role in the process of replication.

- (i) It acts as substrate.
- (ii) It also serves as the source of energy for polymerization reaction.

(Chapter 6, Pg.no.106)

Three mark Question:

Q.21.



Why do you see two different types of replicating strands in the given DNA replication form? Explain. Name these strands.

Answer: We see two different types of replicating strands in the given DNA replication form because DNA polymerase can polymerise only in one direction that is $5' \rightarrow 3'$. Therefore, replication occurs smoothly at $3' \rightarrow 5'$ end of DNA. While on the other (template with polarity $3' \rightarrow 5'$), it is discontinuous. These two strands are known as leading and lagging strands respectively.

(Chapter 6, Pg.no. 106)