**Q.no.1 = What are the significant differences in the process of DNA replication, Transcription and Translation in prokaryotes?**

**Ans= DNA Replication:**

* DNA replication is the process by which DNA makes a copy of itself during cell division or the process of self-synthesis of DNA molecule.
* DNA replication is the production of identical helices from a single double stranded molecule.
* DNA replication occurs for the growth and division of cells.
* The daughter strands are actually synthesized by DNA polymerase enzyme.
* DNA replication is semi-conservative.
* Replication proceeds in the 5’ to 3’ direction on the leading strand, newly formed strand is continuous.
* Primer is used in the DNA replication.
* Entire genome must be copied during DNA replication.

**Transcription:**

* Transcription is a process in which an mRNA copy of the DNA sequence encoding the gene is produced with the help of any enzyme, RNA polymerase.
* Transcription happen in preparation for protein synthesis.
* Transcription factors include a wide number of proteins, excluding RNA polymerase that regulate and initiate the transcription of genes.
* A primer is not used in the RNA synthesis.
* There is no proofreading function during RNA transcription.
* mRNA produced as a result of transcription is not modified in prokaryotic cells.
* Only a portion of the genome is transcribed or copied into RNA.

**Translation:**

* Translation is a process in which mRNA produced by Transcription is decoded the process to produce the polypeptide chain.
* Translation is the first stage of protein biosynthesis.
* In translation, mRNA produced by Transcription is used to produce a specific amino acid chain, or polypeptide that will later fold into an active protein.
* In bacteria translation and transcription happen in the same location and often simultaneously.
* In prokaryotes, process of translation occurs by the formation of a aminocyl tRNA complex.
* Translation usually occurs when ribosomes subunits, initiation factors and tRNA binds the mRNA near the AUG start codon.

**Q.no.2 =**

**Mitosis:**

Mitosis is the division of cell into two daughter cells that are identically genetical to the parent cell.

**Meiosis:**

Meiosis is the division of germ cells into four sex cells (e.g. egg or sperms) each with half the number of chromosomes of the parent cell.

**R-selection;**

In R-selection the animals reproduce very slow and few. E.g. human, elephant, whale.

**K-selection:**

In K-selection the animals reproduce quickly but most offspring survive only to adulthood. E.g. rabbit, fruitfly.

**Point mutation:**

A mutation that causes change of single or few nucleotides in the DNA is called point mutation.

**Silent mutation:**

Silent mutation is the mutation that doesn’t have an observable effect on the person’s phenotype.

**Telophase:**

In telophase, chromosomes arrive at opposite poles and begins to decondense.

Nuclear envelop material surrounds each set of chromosomes. The mitotic spindle breaks down.

**Metaphase:**

In metaphase, mitotic spindle is fully developed, centromeres are at the opposite poles.

Each sister chromatid attaches to the spindle fibre originating from opposite poles.

**Leading strand:**

A leading strand is a single DNA strand that during replication, is replicated in the 5’-3’ direction.

**Lagging strand:**

Lagging strand is one of the two strands of DNA found at the replication fork or junction in the double helix.

**Q.no.3 = (a) what is mutation? What are the roles of mutation in human diseases?**

**(a) = Mutation:**

Mutation is a permanent change in the sequence of DNA that makes up a new allele in the population.

Mutations range in size from change in a single DNA nucleotide to a large segment of a chromosome or whole chromosome or sometimes changes in the number of chromosome. The agents that cause mutations are called Mutagens while the organism in which mutation is occurred is called Mutant.

**Role of mutation in Human diseases:**

Mutation can cause serious genetic diseases in human beings. Most inherited genetic diseases are recessive, which means a person must inherit two copies of the mutated genes to inherit disease. This is the reason marriage between close relative is discouraged; two genetically similar are more likely to give a child two copies of defective gene. Mutations are not genetic, they can be also caused by radiations, viruses, transposons and mutagenic chemicals. But mostly they occur during meiosis or DNA replication. Some of the well-known diseases induced by mutation are as follows;

1. Sickle cell anaemia.
2. Phenylketonuria.
3. Down syndrome.
4. Klinefelter’s syndrome.
5. Turner syndrome.
6. Cystic fibrosis.

**(b) = Differentiate between DNA and RNA? What was the first? DNA or RNA explains with the suitable reasons?**

**Deoxy ribonucleotide (DNA):**

* DNA is a hereditary material in humans and almost all other organisms.
* In DNA, the 5’ end of one nucleotide attaches to the 3’ end of the adjacent nucleotide through a connection called Phosphodiester bond.
* Sugar phosphate arrangement forms the backbone of DNA molecule.
* DNA consists of nucleotides made of deoxyribose sugar.
* Hydrogen bonds formed between adenine and thyamine, guanine and cytosine.
* DNA is responsible for storing and transferring genetic information.
* DNA is stable during alkaline conditions.
* DNA is susceptible to UV damage.

**Ribonucleotide (RNA):**

* Ribonucleotide is a biopolymer used to code, decode, regulate and express genes.
* Adjacent ribonucleotide bases are chemically attached to one another in a chain via chemical bonds called Phosphodiester bonds.
* RNA consists of nucleotides made of a ribose sugar.
* Hydrogen bonds formed between adenine and uracil, guanine and cytosine.
* RNA codes for amino acids and acts as a messenger between DNA and ribosomes to make proteins.
* RNA is usually unstable during alkaline condition.
* RNA is resistant to UV damage.

**Who came first?**

There is some evidence DNA may have occurred first, but most scientists believe RNA evolved first. RNA has a simpler structure and is needed in order for DNA to function. Also, RNA is found in prokaryotes, which are believed to proceed eukaryotes. RNA on its own can also act as catalyst for certain chemical reactions.

Real question is why DNA evolved if RNA existed? The most likely answer fort this is that having a double stranded molecule helps protect the genetic code from damage. If one strand is damaged the other can act as a template for repair. DNA also confer additional protection against enzymatic attack.

***The End!!***