Syllabus subtopic: Science and Technology- developments and their applications and effects in everyday life Achievements of Indians in science & technology; indigenization of technology and developing new technology.

Prelims and Mains focus: About the genome mapping of Indian Cobra and its relevance for India; Genome sequencing and its significance

News: A consortium of scientists, including some from India, have mapped the genome of the Indian Cobra, among the most poisonous snakes in the country.

Background

• Every year, approximately five million people worldwide are bitten by venomous snakes resulting in about 400,000 amputations and more than 100,000 deaths. Each year, about 46,000 people die and 140,000 people are disabled in India from snakebites by the ‘Big 4’ — the Indian cobra, the common krait, Russell’s viper, and the sawscaled viper.

Significance of genome sequencing

• Knowing the sequence of genes could aid in understanding the chemical constituents of the venom and contribute to development of new anti-venom therapies, which have remained practically unchanged for over a century.

• Highquality genomes of venomous snakes will enable generation of a comprehensive catalogue of venomglandspecific toxin genes that can be used for the development of synthetic antivenom of defined composition.

Why is it important for India?

• Sequencing a genome is an important step to making antivenom but wouldn’t on its own solve the problem of making and supplying enough of the product to address the huge volume —and variety — of snakebites in India, according to independent scientists.
India is the snakebite capital of the world. Though bites from 60 of 270 species of Indian snakes are known to kill or maim, antivenom now available is only effective against the 'Big 4.'

These 4 species are not found in northeastern India but the region reports a significant number of snake bites. That implies we need new kinds of antivenom against species here. The krait in Punjab produces a venom chemically different from the krait in South India.

About Genome Sequencing

- Genome sequencing is figuring out the order of DNA nucleotides, or bases, in a genome—the order of As, Cs, Gs, and Ts that make up an organism’s DNA. The human genome is made up of over 3 billion of these genetic letters.

- Today, DNA sequencing on a large scale—the scale necessary for ambitious projects such as sequencing an entire genome—is mostly done by high-tech machines. Much as your eye scans a sequence of letters to read a sentence, these machines "read" a sequence of DNA bases.

Why is genome sequencing so important?

Sequencing the genome is an important step towards understanding it.

- At the very least, the genome sequence will represent a valuable shortcut, helping scientists find genes much more easily and quickly. A genome sequence does contain some clues about where genes are, even though scientists are just learning to interpret these clues.

- Scientists also hope that being able to study the entire genome sequence will help them understand how the genome as a whole works—how genes work together to direct the growth, development and maintenance of an entire organism.
Finally, genes account for less than 25 percent of the DNA in the genome, and so knowing the entire genome sequence will help scientists study the parts of the genome outside the genes. This includes the regulatory regions that control how genes are turned on and off, as well as long stretches of "nonsense" or "junk" DNA—so called because we don't yet know what, if anything, it does.