# CISCE VIRTUAL LEARNING SERIES

## LESSON: ISC BIOLOGY

## BIOTECHNOLOGY AND ITS APPLICATIONS

**October 8TH & 9TH, 2020**

### Response to Questions posed by students during the live Lesson:

| S. No. | Questions | Answers |
|---|---|---|
| 1. | How are the copy number of plasmid vector and yield of the recombinant protein related to each other? | More copy number means higher degree of expression of the foreign DNA; hence more product is obtained. |
| 2. | Can exonuclease be used while producing a recombinant DNA molecule? | No. |
| 3. | What do "Eco", "R" and "I" refer to in the enzyme EcoRI? | E = Escherichia (the genus of the source bacterium),<br>co = coli (species),<br>R = RY13 (the strain of the bacterium)<br>I = First RE to be isolated from the bacterium E. coli RY 13 |
| 4. | Why are proteases added while isolating the DNA? | They are used to remove proteins from the cell lysate; otherwise they interfere with DNA extraction. |
| 5. | Please explain the difference between bio-engineering and bio-technology. | Bioengineering is based on the application of principles of engineering to the field of biology (for example development of imaging devices, implants, pacemakers etc); whereas biotechnology is based on the use of microbes or their enzymes to produce bioactive products (hormones, enzymes, vaccines etc.). |
| 6. | Is DNA edible? | Yes, it is present in many of our food items. |
| 7. | What is satellite DNA? | These are short (about 5 to 100 bp long) highly repetitive nucleotide sequences present in eukaryotic genomes. |
| 8. | Please explain the separation of DNA FRAGMENTS. | DNA fragments are placed in a matrix of agarose gel under mild electric field where they move towards anode and thus separate according to their charge and size. This process is called agarose gel electrophoresis. |

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| 9. | What is selectable marker? | These are genes in the vector which enable the researchers to locate the transformed host in a population containing transformed and non-transformed hosts. |
| 10. | What is the cloning vector? | Cloning vector is fragment of DNA which is used to transfer the foreign DNA into a suitable host. |
| 11. | Do the sticky ends not join again after they are cut by the restriction enzymes? | Yes, they can; but this can be prevented by using specific concentration of ions in the medium and also by keeping the temperature of the medium slightly high. |
| 12. | Why is cloning vectors also called cloning vehicles? | This is because they 'carry' the foreign DNA into the target host. |
| 13. | What is blue white selection? | It is a method of selection of transformed host. |
| 14. | During electrophoresis, is there any mechanism used to indicate how long to run the gel? | A 'tracking-dye' is used that moves in the same direction in which the fragments are moving. When it reaches the top of the gel, the process is stopped by switching off the power supply. |
| 15. | Why does the Restriction Enzyme not cut the Bacterial DNA? | The target sequences in bacterial DNA are protected due to the modification (methylation) of bases. This is called restriction modification system. |
| 16. | In the context of genetic engineering, what do we mean by 'vehicle'? | Cloning vectors are also called cloning 'vehicles'. |
| 17. | What is a "strand" of DNA? | It is a linear sequence of nucleotides joined together by phosphodiester bonds. |
| 18. | What is Western Blotting? | It is a method of detecting specific protein in a mixture of different types of proteins. |
| 19. | Which enzyme helps to remove phosphate group from 5'-end of double or single stranded DNA or RNA? | Alkaline phosphatases |
| 20. | How many strands make up a DNA double helix? | According to Watson and Crick's model, each DNA molecule is made of two complementary strands. |
| 21. | When modified Ti-plasmid is introduced into a new Agrobacterium, is the earlier Ti-plasmid of this new bacterium removed? If yes, how? | Yes. This is made possible by using binary vector system / co-integrate vector system. In this process, the foreign gene is first cloned in the cloning site of an intermediate vector, like E coli, which is then mated with Agrobacterium so that the foreign gene is transferred into the latter. |

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| 22. | Why is tungsten used in gene gun technique? | It is inert, hence does not react with cellular components. |
| 23. | What is X-gal? | It is a chromogenic substrate which is a synthetic analogue of lactose. It is metabolised into blue coloured product by the enzyme beta-galactosidase. Hence, it is used in blue white selection. |
| 24. | What are IPS cells? | Induced pluripotent stem cells (iPS). These are produced by forcing differentiated somatic cells to become pluripotent where they can proliferate and differentiate into a variety of cell types. |
| 25. | Can an average molar concentration of human DNA be provided for each human cell? Why? | Cells maintain their own DNA content by following specific sequence of steps of cell cycle. During gamete formation, the chromosome number, hence the DNA content, is reduced to half, which is restored at the time of fertilisation. |
| 26. | What is forensic science? | It is concerned with methods and techniques of crime investigation on the basis of available evidences. |
| 27. | While doing PCR, if 'denaturation' step is missed, what will be its effect on the process? | Denaturation causes the DNA strands to separate and act as templates. If the strands do not separate, the DNA will not be amplified. |
| 28. | What is the meaning of gene library? | It is a collection of genes/ DNA fragments of the entire genome of an individual. |
| 29. | What is the use of GM foods? | They are created with a specific purpose, for example golden rice was produced to overcome vitamin-A deficiency. |
| 30. | Gene therapy is temporary. So, after what time period should it be done again? | It depends upon the nature of the transformed cell and the vector used in the process. |
| 31. | What are bioreactors? | These are large-sized vessels used to provide optimum conditions for carrying out biochemical transformations by live cells/ microbes. |
| 32. | During PCR, is there any formation of Okazaki fragments? | No. |