

Delhi Public School Ghaziabad
Class XII – Biology lesson plan based on DOL
Chapter 11 – Biotechnology – Principles and processes

Unit	Biotechnology (Chapter 11 – Biotechnology: Principles and processes)
Class Transaction	Total: 6 periods
Pre-requisite for the course	This lesson requires • Basic knowledge of DNA and genes • Knowledge of gene modification • Knowledge of genetically modified plants and animals
Assessment of qualifying knowledge	• Written test • Lab activity • Oral questioning
Objective	Students would be able to understand • Principles of biotechnology • Tools of recombinant DNA technology • Selection of transformed and recombinant cells • Mechanism of amplification of DNA
Learning Outcomes	<u>KNOWLEDGE</u>- <i>Students will know and understand</i> - Principles of biotechnology - Tools of recombinant DNA technology - Selection of transformed and recombinant cells <u>SKILLS</u>- <i>Students would be able to</i> - Understand mechanism of Polymerase chain reaction - Understand difference between sparged and stirred tank bioreactor - Understand use of marker genes for selection of recombinant cells Competencies developed in students: collaborative learning, critical thinking and problem solving, character building, communication, citizenship
Transaction Methodology (The teacher can use the mentioned techniques, wherever applicable, and can use any other too.)	Transaction would proceed in the following manner- <i>Brain Storming</i>-The class would start with a discussion on what the students have already learnt in the previous classes and hence what is it that they would learn now. They would also be told the significance of the topic that they would be studying. <i>Introduction of the topic</i>- ppt and Digital Content would be shared <i>Guided practice followed by Independent Practice</i>- NCERT questions to be discussed in the classroom. Techniques to be used: Quiz, MCQ, Peer Assessment, Case Studies, Lab Activities, Any Other
Resources	NCERT text book, Reference Book, CBSE Exemplar, DPSG Spiral www.learncbse.in/cbse-notes/ https://mycbseguide.com www.examfear.com
Self Study, Home Work, Assignments	Independent Practice: Students would do the given questions in their spirals. It is also advised that the students come to the class with proper background

	knowledge of the topic under discussion. They can refer to the resources stated above.
Assessments	UNIT TESTS , MID TERM EXAMINATION, HALF YEARLY EXAMINATION, ANNUAL BOARD EXAMINATION
Addressing Classroom Diversity	Due to various social backgrounds and multiple intelligences, the classroom might be a diverse arena. The following techniques can be used for various groups: <i>For high scoring students:</i> High order thinking questions to be done Encouragement for referring other resources <i>For low scoring students:</i> Spiral questions Peer education PCC classes <i>For differently abled students:</i> Call parents at regular intervals Provide grade-up classes Encourage and motivate them at every level.
Marks	The weightage of whole unit is 10 marks and is given by CBSE.

Day 1:
a. Students will be shown a ppt and will be made aware of difference between traditional and modern biotechnology.
b. Students will be told about the gene cloning and origin of replication.
c. Students will be told about the, tools of recombinant DNA technology.
Guided practice: DOL 1
a. Students will be made to write differences between traditional and modern biotechnology.
b. Students will be made to draw diagrams to show formation of recombinant DNA.
c. Students will be asked to describe and discuss in groups about the importance of maintaining sterile conditions in microbial culture.
Creativity and innovation: Students use the knowledge given in class and create projects and models and perform research to give innovative solutions to the problem studied.
Communication: Involves sharing of ideas and information to advance scientific understanding, processes, theories and discoveries
Summarize and check for understanding: DOL 2
a. Oral questioning based on the day's teaching.
Independent practice: DOL 3
a. Students will be asked to revise the work done in class.
b. Students will be asked to list disadvantages of conventional hybridization programmes.

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Day 2:
a. Students will be shown a ppt and will be made aware of tools of recombinant DNA technology.
b. Students will be told about the enzymes, vectors and selection methods in recombinant DNA technology.
c. Students will be told about the separation, visualization and elution of DNA.
Guided practice: DOL 1
a. Students will be made to write difference between endonuclease and exonuclease.
b. Students will be made to draw diagrams to show formation of recombinant DNA.
c. Students will be asked to describe and discuss in groups the process of the selection of transformed and nontransformed, recombinant and non recombinant DNA.
Creativity and innovation: Students use the knowledge given in class and create projects and models and perform research to give innovative solutions to the problem studied.
Communication: Involves sharing of ideas and information to advance scientific understanding, processes, theories and discoveries
Summarize and check for understanding: DOL 2
a. Oral questioning based on the day's teaching.
Independent practice: DOL 3
a. Students will be asked to revise the work done in class.
b. Students will be asked to show recombination diagrammatically.

Day 3:
a. Students will be shown a ppt and will be made aware of restriction enzymes.
b. Students will be told about the types of ends produced by restriction enzymes.
c. Students will be told about the separation, visualization and elution of DNA.
Guided practice: DOL 1
a. Students will be made to write difference between endonuclease and exonuclease.
b. Students will be made to draw diagrams to show formation of recombinant DNA.
c. Students will be asked to describe and discuss in groups the process of the selection of transformed and nontransformed, recombinant and non recombinant DNA.
Creativity and innovation: Students use the knowledge given in class and create projects and models and perform research to give innovative solutions to the problem studied.

Communication: Involves sharing of ideas and information to advance scientific understanding, processes, theories and discoveries
Summarize and check for understanding: DOL 2
b. Oral questioning based on the day's teaching.
Independent practice: DOL 3
a. Students will be asked to revise the work done in class.
b. Students will be asked to show recombination diagrammatically.

Day 4:
a. Students will be shown a ppt and will be made aware of making cells competent with recombinant DNA.
b. Students will be told about the gene transfer methods.
c. Students will be made aware of differences between vector less and vector mediated methods.
Guided practice: DOL 1
a. Students will be made to recall steps of making cells competent with recombinant DNA.
b. Students will be asked to list differences between vector less and vector mediated methods.
c. Students will be asked to describe and discuss in groups direct gene transfer methods.
Character and citizenship: Group discussion helps to develop interpersonal skills, respecting and valuing views of others
Collaboration and communication: Students learn to work in collaboration to achieve a common goal. They learn to manage time and divide and delegate work and responsibilities.
Summarize and check for understanding: DOL 2
a. Oral questioning based on the day's teaching
b. Discussion on the topic in groups – significance of making cells competent.
Collaboration: Students learn to work in collaboration to achieve a common goal. They learn to manage time and divide and delegate work and responsibilities.
Communication and brainstorming: Students develop effective communication skills and learn to put across their views.
Independent practice: DOL 3
g. Students will be asked to revise the work done in class.
b. Students will be asked to describe process of direct gene transfer methods.

c. Students will be asked to describe differences between vector less and vector mediated methods.

Day 5:
a. Students will be shown a ppt and will be made aware of difference between vector mediated and vector less methods of gene delivery.
b. Students will be told about the microinjection and biolistics
c. Students will be told about the separation, visualization and elution of DNA.
Guided practice: DOL 1
a. Students will be made to write difference between endonuclease and exonuclease.
b. Students will be made to draw diagrams to show formation of recombinant DNA.
c. Students will be asked to describe and discuss in groups the process of the selection of transformed and nontransformed, recombinant and non recombinant DNA.
Creativity and innovation: Students use the knowledge given in class and create projects and models and perform research to give innovative solutions to the problem studied.
Communication: Involves sharing of ideas and information to advance scientific understanding, processes, theories and discoveries
Summarize and check for understanding: DOL 2
c. Oral questioning based on the day's teaching.
Independent practice: DOL 3
c. Students will be asked to revise the work done in class.
d. Students will be asked to show recombination diagrammatically.

Day 6:
a. Students will be shown a ppt and will be made aware of process of polymerase chain reaction.
b. Students will be told about the process of significance of PCR.
c. Students will be made aware of types of bioreactors.
Guided practice: DOL 1
a. Students will be made to draw a diagram to show process of PCR.
b. Students will be asked to describe and discuss types of bioreactors.
Character and citizenship: Group discussion helps to develop interpersonal skills, respecting and valuing views of others
Collaboration: Students learn to work in collaboration to achieve a common goal. They learn to manage time and divide and delegate work and responsibilities.

Creativity and innovation: Students use the knowledge given in class and create projects and models and perform research to give innovative solutions to the problem studied.
Summarize and check for understanding: DOL 2
a. Oral questioning based on the day's teaching
b. Discussion on the topic in groups– importance of PCR in diagnostics.
Character and citizenship: Group discussion helps to develop interpersonal skills, respecting and valuing views of others
Collaboration: Students learn to work in collaboration to achieve a common goal. They learn to manage time and divide and delegate work and responsibilities.
Independent practice: DOL 3
a. Students will be asked to revise the work done in class.
b. Students will be asked to explain PCR.
c. Students will be asked to draw a diagram to show stirred tank and sparged tank bioreactor.

Closure of the lesson
Summarizing the lesson by mind mapping
Giving them revision worksheets