# BIOTECHNOLOGY- PROCESSES AND APPLICATIONS.

**TIME** [3 Hr 30 mins]

**OVERVIEW**

Biotechnology is the latest field of Biology with inter disciplinary dimensions. This lesson plan involves the story of the beginning of biotechnology, its advancement to its applications in various fields like industry, agriculture, medicine, research and many more. To explain the concept of this voyager stories and project has been made to show the real time google earth location of places of origin of various tools and techniques used in Biotechnology.

**BIOLOGY/ BIOTECHNOLOGY- PROCESSES AND APPLICATIONS.**

**AGE LEVEL** Grade 12 (15-17 years)

**Learning Objectives**

**Students will be able to-**

1. Describe biotechnology and various tools used in it.
2. Discuss the history, present and future of biotechnology.
3. Identify and explain the role of tools and techniques required for biotechnology with special emphasis on genetic engineering and chemical engineering.
4. Find the applications of biotechnology in agriculture, human health care, forensic sciences, formation of GMO's or Transgenic organisms
5. Define a GMO and comment on the advantages and disadvantages on a GMO.
6. Generate awareness about world scenario of biotechnology and issues related to it like exploitation of animal rights, release of GMO's, biosafety, etc

**Inquiry**

Can Science make Tailor made changes in the babies?

Can we alter the genome of an organism?

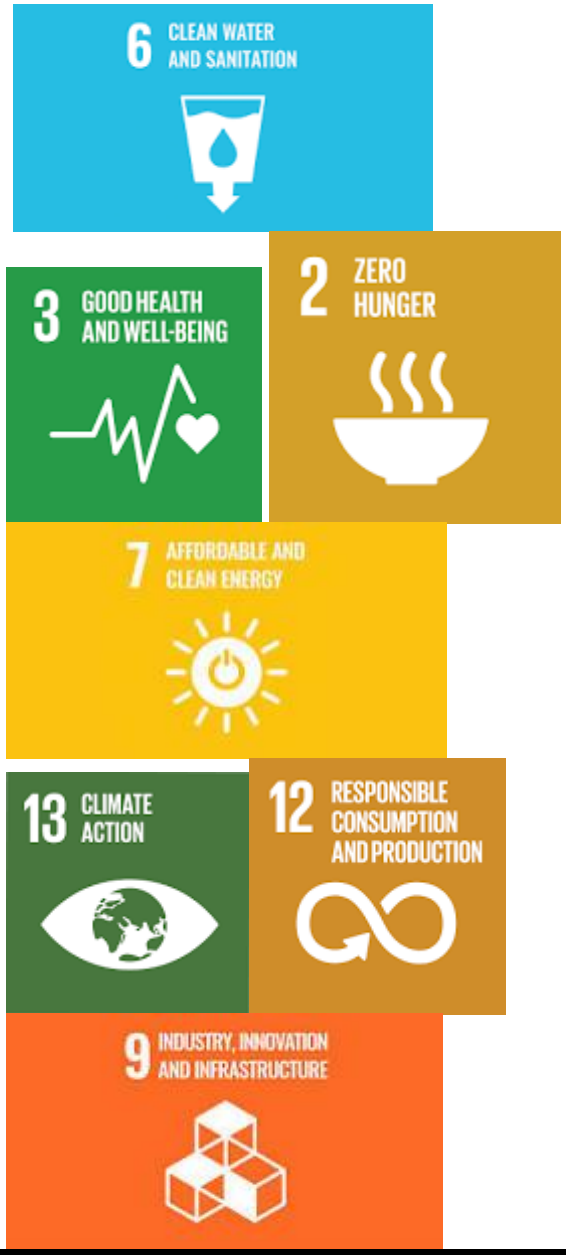
Can we permanently cure a genetic disease ?

These questions will pique the interest of the learner deep into the concept and develop a curiosity to know more about Biotechnology.

Then by letting students discuss possible answer to these questions in small crews.

| Materials Needed | Lesson Summary |
| --- | --- |
| 1. Internet connection for learner<br>2. Google Earth access<br>3. Textbook NCERT Grade 12<br>4. Notebook and stationary items to make notes. | • Engage: Learners will be given pre-work and post-work on a set of questions to see the change in their understanding after the video shown and discussion by the teachers. They will also fill the KWL sheet.<br>• Explore: Learners will watch the Google Earth voyager Project story made and attached here. They will make notes and observations from that.<br>• Explain: Teachers divide the class into 5-6 groups of 3-4 students each. Each group will be given a task for eg. Enzymes, PCR, Electrophoresis, ELISA, Biorector, Applications in medicine, industry, agriculture.<br>• Revise: Learners can also play a dumb charade where a team will present some material to hint on some biotech tools The other team will have to guess the name in the hint and tell its role.<br>• Apply: Learners will asked think of many such areas of medicine, agriculture and industry where Biotechnological tools can be applied for the welfare of the mankind. |

**Sustainable Development Goals**




**Culminating Task/Assessment**

Learners will analyse the use of different tools of biotechnology in making GMOs, drugs, medications like – insulin, different diagnostic techniques to diagnose and cure diseases.

They will be assessed on the ability to comprehend all these.

**Textbook Chapter**

This topic is covered in NCERT Grade 12 Unit- IX Chapter 11 Biotechnology Processes and Principles and Chapter 12 Applications of Biotechnology.

| **Engage (45 minutes)** |
|---|
| 1. Session commences with general discussion about the terms like bacteria, plasmid, genes, DNA, enzymes , proteins etc. to provoke the previous knowledge of the learners.<br>2. Learners will be presented with a set of questions and asked to give their response in a doc file https://docs.google.com/document/d/1Q9lc_jw6E2wZEu5ZUMjx1MrtbBXR_uftnTyMBkICkGs/edit<br>3. Learners will be then shown video on RDT (Recombinant DNA Technology) https://www.youtube.com/watch?v=Qo9gcZ0r8k8&t=11s |

https://www.youtube.com/watch?v=rhd_fBPyzSM

https://www.youtube.com/watch?v=nfC689ElUVk

4. The video session will be followed by answering the same questions in the same doc file, for the learners to see a change in their understanding.
5. Then a KWL(know , want to know and learned) sheet is shared with the students to be filled where they will enter what they already know about the Biotechnology, want to know more in this context and learned- where they will enter what they have learned after the lesson gets over https://docs.google.com/document/d/1VqrK8J1yUbHP1XF4FadKgWIapl9-xreJ0lOUws5-oqA/edit.
6. Activate prior knowledge and prepare students for new concepts, skills or processes.
7. Introduce the essential question that will guide the inquiry investigation.

**Explore (25 minutes)**

1. Learners will be exposed to a Google Earth voyager story of project Timeline of Global Biotechnological advancement, https://earth.google.com/earth/rpc/cc/drive?state=%7B%22ids%22%3A%5B%2215hZpD9jNEP1rjllUOXPPxLyIPYzane19%22%5D%2C%22action%22%3A%22open%22%2C%22userId%22%3A%221095008381367358 27948%22%7D&usp=sharing
2. Here learners will experience and visually observes the different regions of the globe where Biotechnological tools were discovered.
3. This will help students to memorize the timeline of Biotechnology and locate various internationally important institutes working to choose a career.

**Explain (30 minutes)**

1. Teachers divide the class into 5-6 groups of 3-4 students each.
2. Each group will be given a task for eg. Enzymes, PCR, Electrophoresis, ELISA, Biorector, Applications in medicine, industry, agriculture.
3. Students will share their concepts researched about and learned about in their respective small groups.
4. Initially they will share in their small groups followed by whole class discussions.
5. Session is then open for open ended questions.

**Revise (30 minutes)**

Learners will begin a relay race, with each student vocalizing any one concept learned in this lesson plan, turning to second one, third one and so on…….

Learners can also play a dumb charade where the whole class is divided into two teams one team will present some material to hint on some biotech tools eg scissor to hint for restriction enzymes.

The other team will have to guess the name in the hint and tell its role.

This playful way will help in cheerful revision of the concept.

**Apply (80 minutes)**

1. Learners will asked think of many such areas of medicine, agriculture and industry where Biotechnological tools can be applied for the welfare of the mankind.
2. For eg. The development of golden rice was meant to solve the problem of vitamin A deficiency, think more of such instances.
3. Learners can develop such models to solve the problem of hunger, poverty, sustainability to serve the SDG

goals.

**Evaluate: Exemplar Response and/or Rubric**

- https://quizizz.com/join/search/biotechnology?languages=English
- https://quizizz.com/join/quiz/5c66d7d1f41441001cf8f12f/start

**Additional Resources**

1. You tube link –
- https://www.youtube.com/watch?v=UhHQs6ZcK_g
- https://www.youtube.com/watch?v=Qo9gcZ0r8k8
- https://www.youtube.com/watch?v=ECSOP2K7Be4&list=PLTmnqGGzvWA5jB2qskMIayVxGSVC9KlkU
2. PPT
    - https://drive.google.com/file/d/151Y8orjYnkFawljteKTdvmkaEGeutSTV/view
    - https://drive.google.com/file/d/1H-Ou6UCdP0CpjoGn4ehrJ4Yi5-XAYqn5/view
3. https://www.askiitians.com/biology/biotechnology-principles-and-processes/

**Options for Differentiation**

Interested learners can be made to write an article of the history of biotechnology and research about the best research labs working on genme of plant and animals.

Credits

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