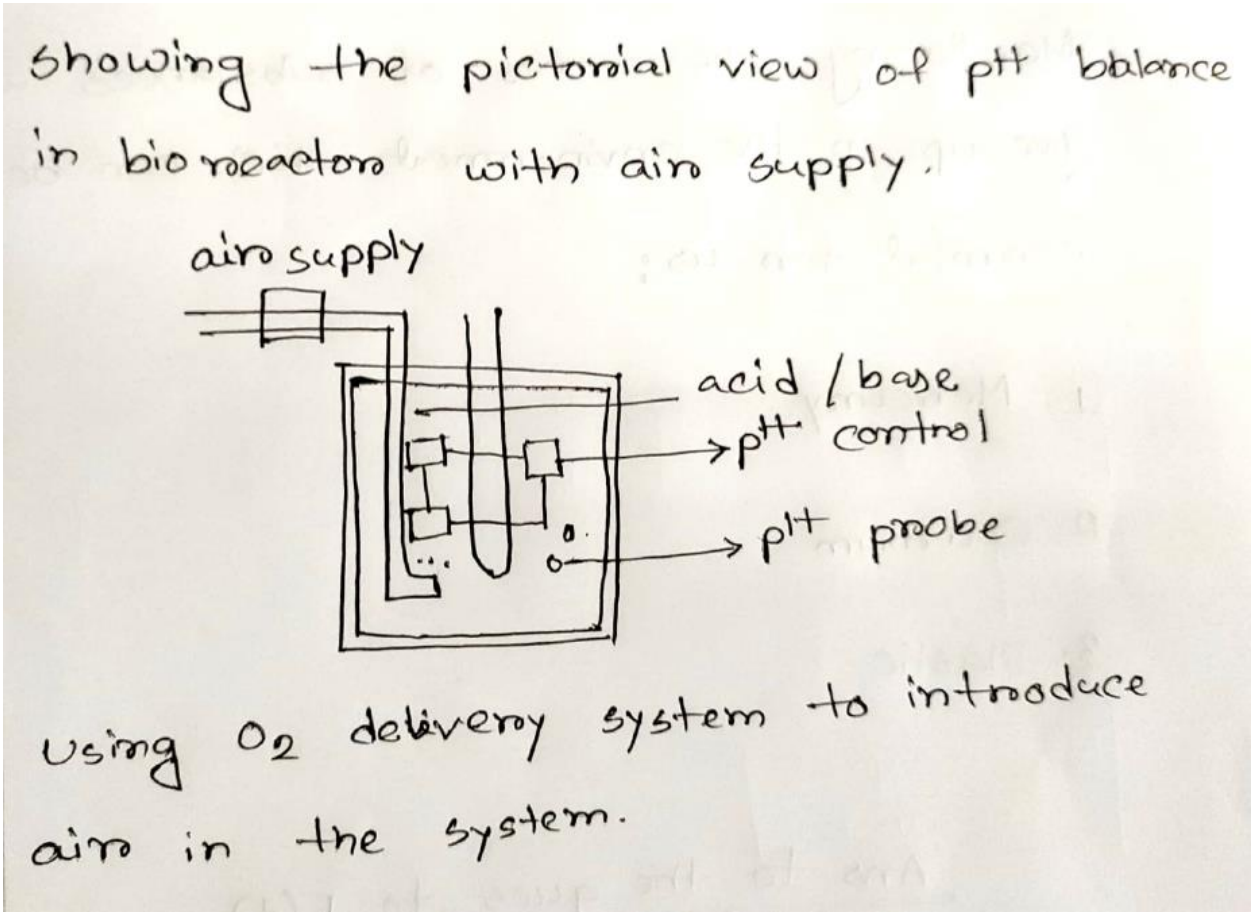
Biotechnology

1. Show a pictorial view of the pH balance in a bioreactor. Also, show how you will maintain the necessary air supply.

Answer:



2. Mention the enzymes needed to prepare a DNA sample before pushing it through gel electrophoresis.

Answer: The enzymes needed to prepare a DNA sample before pushing it through get electrophoresis:

- Lysozyme – to break the bacterial cell wall.
- Cellulase – to break the plant cell wall.
- Chitinase – to break the fungal cell wall.

- Ribonuclease – removes RNA.
- Protease – removes proteins (such as histones that are associated with DNA).

Other macromolecules are removable with other enzymes or treatments. Ultimately, the addition of ethanol causes the DNA to precipitate out as fine threads. This is then spooled out to give purified DNA.

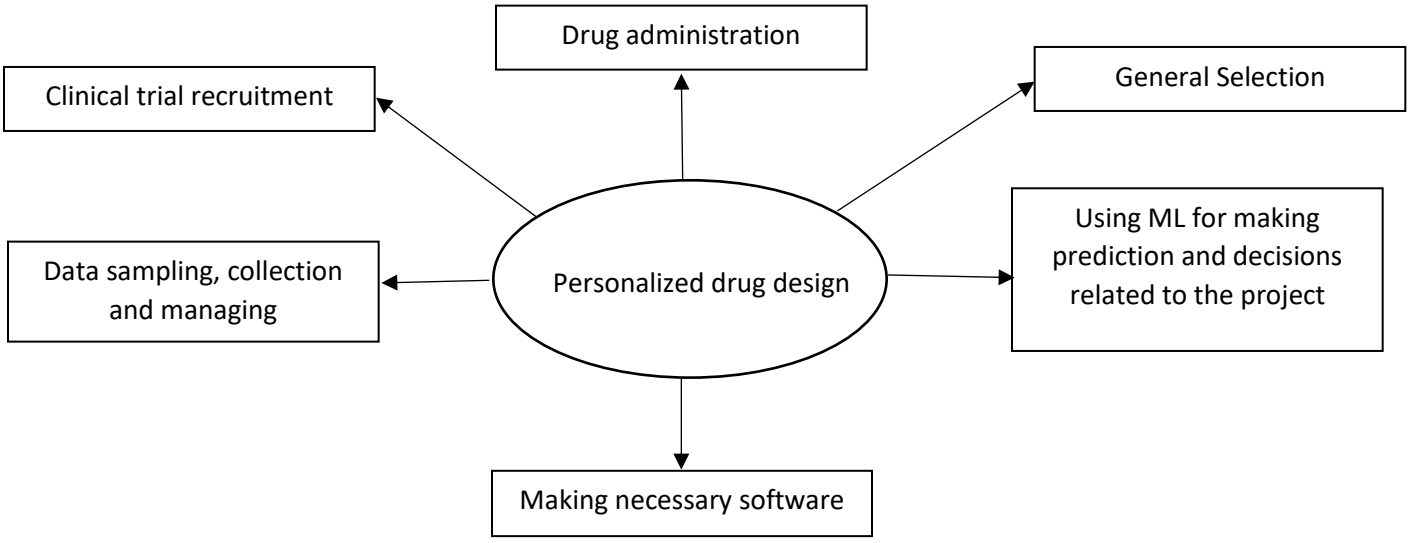
3. Name the goods you would like to protect against biopiracy that is native to Bangladesh (Naming 5 would be sufficient).

Answer: Biopiracy is a situation where indigenous knowledge of nature, originating with indigenous people, is used by others for profit, without permission from, and with little or no compensation or recognition to the indigenous people themselves. The goods I'd like to protect against biopiracy that is native to Bangladesh are:

- Hilsa
- Different types of gourds (bitter gourd, pointed gourd, ribbed gourd, snake gourd, sponge gourd, wax gourd, teasle gourd)
- Jute
- Royal Bengal Tigers
- Sarees (Muslin, Jamdani)

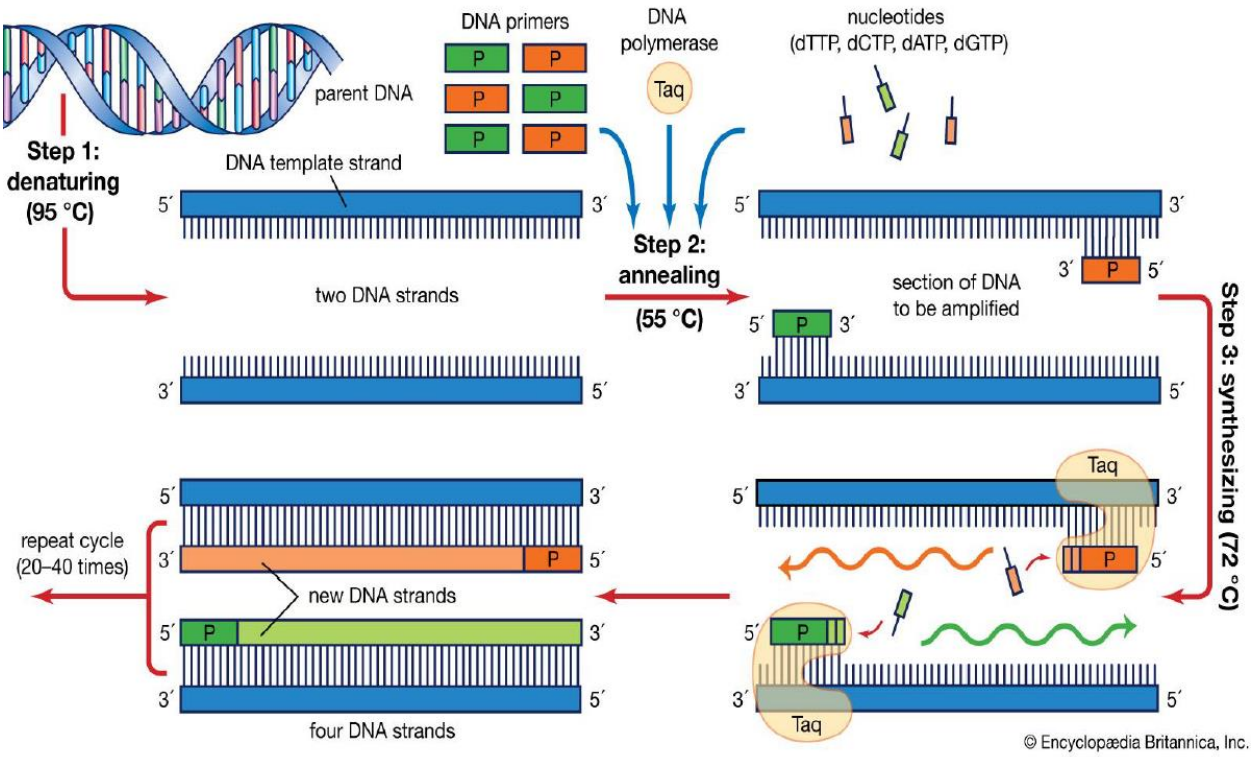
4. Do you think you have the scope to give your input as a computer engineer in personalized drug design?

Answer: Yes, I can give my input as a computer engineer in a personalized drug design.
I can make software, use data science knowledge to process and manage data for the project, etc.
They're described below via diagrams:



5. Show the pictorial view of the PCR chain including polarities for DNA.

Answer:



6. Mention the name of the characteristics of a competent host. How you would apply a complete rDNA to a plant (mention only the names of the means you are going to use).

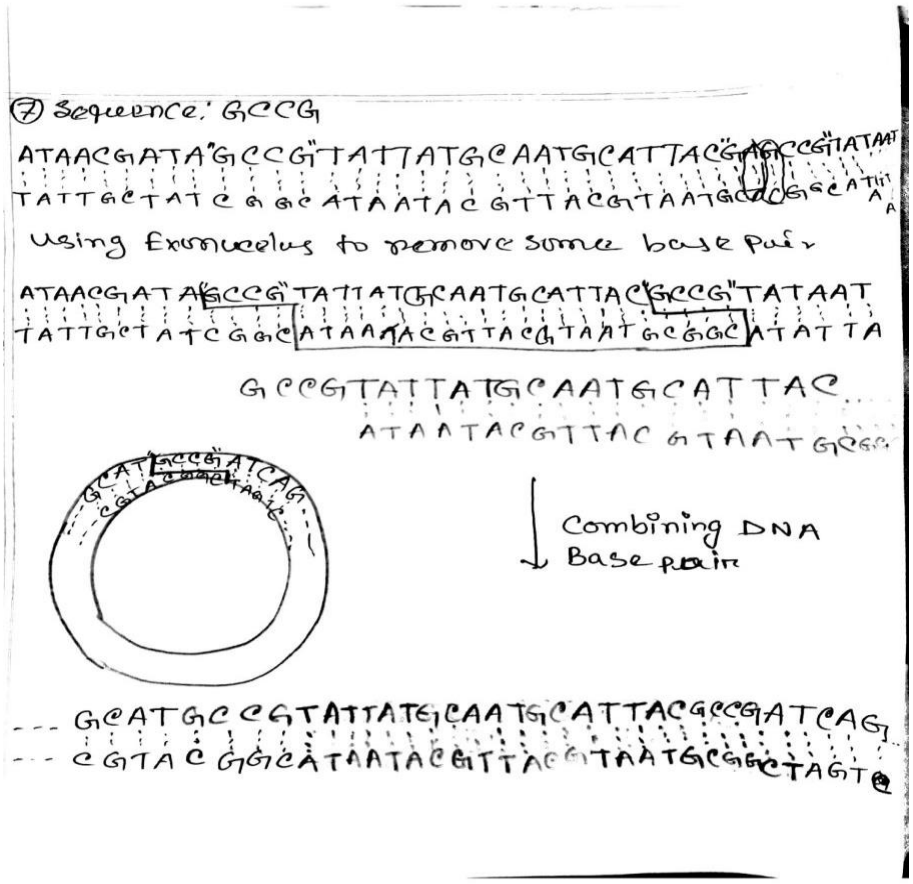
Answer: Competent host characteristics:

- Since DNA is a hydrophilic molecule, it cannot pass through cell membranes so the bacterial cells must first be made 'competent' to take up DNA.
- Several methods are followed to make the bacterial cells competent.
- Treating them with a specific concentration of a divalent caution, such as calcium, increases the efficiency with which DNA enters the bacterium through pores in its cell wall.
- Recombinant DNA can be directly injected into the nucleus of an animal cell by a method called micro-injection.

The biolistic procedure, also known as the "gene gun", involves firing small metal particles coated with the constructed DNA into plant cells. The metal particles, usually gold or tungsten, are accelerated to high speed by the rapid release of high-pressure helium in the gene gun into the target cell.

7. Suppose you have a restriction enzyme that has a recognition sequence GCCG. How you would complete the rDNA for a given sequence of one strand is below shown in a pictorial view (You need to complete the DNA with a complementary strand before starting the process).
ATAACGATAGCCGTATTATGCAATGCATTACGAGCCGTATAAT

Answer:

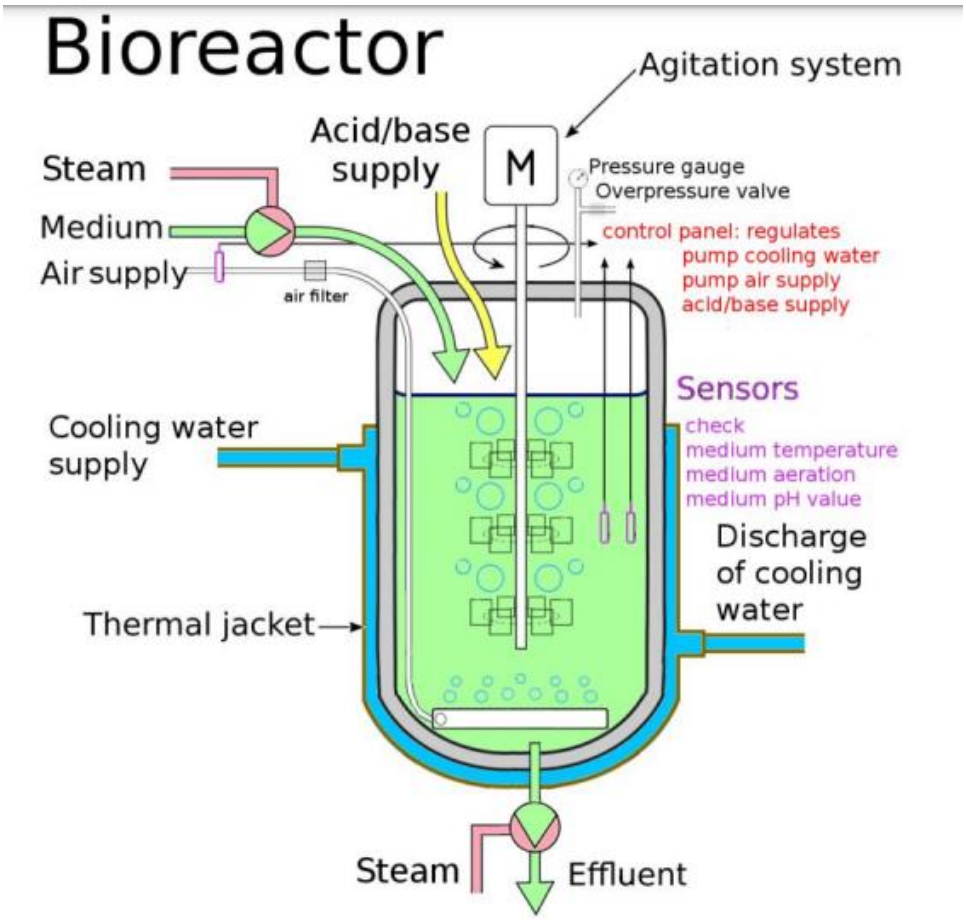


8. Find the total number of base pairs of samples "A" and "C" from below.

Answer:

9. Show a pictorial view of the nutrient supply and temperature control in a bioreactor.

Answer:



Temperature control: The majority of mammalian cell lines have an optimal operation at the physiological temperature of 37 °C. A temperature of over 38 °C can quickly have a dramatic effect on cell viability, while a lower temperature can result in slower cell metabolism. It is important to maintain a homogenous constant temperature in the bioreactor. This is controlled by a temperate sensor, a water jacket on the bioreactor, and a temperature control unit (TCU).

Nutrient supply: During a bioprocess, microorganisms usually consume a wide array of nutrients. The basic composition of a nutrient medium usually consists of water, a usable energy source for the organism (e.g., glucose), as well as the nutrients it needs (carbon, nitrogen, and phosphorus), salts, and trace elements. Depending on the organism, other compounds are necessary that cannot be synthesized by yourself (vitamins, essential amino acids, etc.).

10. Do you think we need a protocol to monitor transgenic animal issues? Propose some basic points that you think we should include in the protocol.

Answer: Yes, I can think we need a protocol to monitor transgenic animal issues. We know transgenic allows us to know how genes work the normal functions of the body and its development. In these processes, there are some risks. To avoid these risks, we must have a protocol to monitor transgenic animal issues.

1. Regular government framework to ensure animal safety.
2. Predicating the risk before initialization.
3. Making awareness among people
4. Making sure the implementation of those rules and that they're followed as well.

11. Do you think you have the scope to give your input as a computer engineer in gene therapy for a project?

Answer: Yes, I think I can give my input as a computer engineer in gene therapy for a project. Gene therapy is at the forefront of curing severe and often debilitating genetic disorders.

Common concepts such as: using ml to predict, data analysis, software development for this, etc. Couldn't find any accurate solution.

12. Name the specific fields where you can give your input as a computer engineer.

Answer: Computer engineering is very relevant in the field of biotechnology and computer science skills will continue to be crucial to the growth of the field. Fields I can input as a computer engineer in biotechnology are:

- **Bioinformatics software development:** Bioinformatics Engineers, also called Bioinformatics Software Developers, are computer scientists that write software applications and tools that are used by biologists in the field of biotechnology and bioinformatics to perform research and analysis. Bioinformatics engineering requires a deep understanding and sound knowledge of algorithms, data structures, high-performance computing, and software engineering.
- **Computational Biology:** It is a field that requires the combination of computer science and biology to develop the underlying algorithms that are used in data analysis to try and understand biological processes. In modern society, biological and genetic data are much more accessible.
- **Bioinformatics Analysis:** Bioinformatics Analysts perform large-scale analysis and manipulation of biological data to present the data in an organized way.

13. Suppose you have a primer sequence GCATTA. In PCR you have a fragment of DNA with 25 spaces for bases which will repeat itself after every six sequences. If the above-mentioned primer fits on the right-hand side of your desired DNA strand, show the whole DNA strand before and show the whole picture after the elongation process.

Answer:

14. Why do you put a DNA sample in the negative terminal of the device for gel electrophoresis?

Answer: Gel electrophoresis is a technique used to separate DNA fragments according to their size. DNA samples are loaded into wells (indentations) at one end of a gel, and an electric current is applied to pull them through the gel. DNA fragments are negatively charged, so they move towards the positive electrode. Because all DNA fragments have the same amount of charge per mass, small fragments move through the gel faster than large ones.