

**SAMPLE CONTENT**

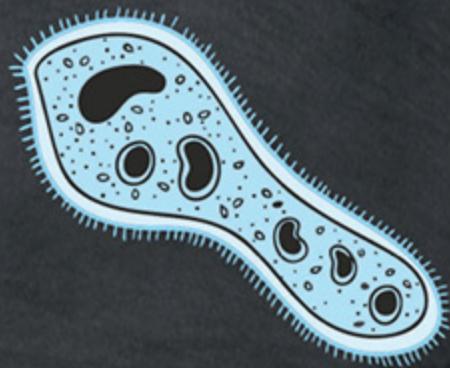


# SMART NOTES

Handwritten Notes For You

Standard X

Science &  
Technology - II



**Target** Publications Pvt. Ltd.

Written as per the latest syllabus prescribed by the Maharashtra State Bureau of Textbook Production and Curriculum Research, Pune.

STD. X

# Science and Technology

## Part - II

### Salient Features

- Written as per the new syllabus
- Exam oriented coverage of entire syllabus
- Includes 'Smart Recap' to reinforce key concepts
- 'For your understanding' section provides lucid explanation
- 'Interesting fact' section highlights additional information related to the topic
- Chapter-wise assessment with every chapter for knowledge testing
- Model Activity Sheet in accordance with the latest paper pattern

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## PREFACE

While creating this book, our core intent was to develop a sourcebook that would be extremely exam oriented and aid students to face the Board Examination confidently.

**Science and Technology: Std. X Part - II** has been prepared as per the new syllabus and paper pattern which is extremely student-centric and focuses on active learning along with making the process of education more enjoyable and interesting.

We have infused the book with a liberal sprinkling of real life examples, pictorial explanations and additional questions. A series of questions titled under 'Use your brain power', 'Can you tell', 'Think about it' and various similar titles pave the way for a robust concept building.

Every chapter begins with covering all the textual content in the format of Objectives, Question & Answers, Give Reasons, Diagram-based questions, Paragraph based questions and a host of other Objective and Subjective type of questions.

Through the course of creating this book, we realised that at times an answer is too detailed and long to be included in the text. At such instances, we have provided a tab called '**For your understanding**' which although not a part of the answer, explains the students the underlying concept. We have also provided a section called '**Interesting fact**' which uses analogies and explains a scientific concept's real world applications. Moreover, it also highlights interesting information related to topic.

We have allotted marks to Questions in accordance with the new marking scheme. '**Smart Recap**', which provides a quick revision of the important topics of a chapter has been included where deemed necessary. The chapter eventually ends with a '**Test your understanding**' section that stands as a testimony to the fact that the student has understood the chapter thoroughly.

We have also included a '**Model Activity Sheet**', designed as per the latest paper pattern. It is a unique tool for a student that enables self-assessment.

We hope students find this book resourceful and love it as much as we loved creating it.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us at: [mail@targetpublications.org](mailto:mail@targetpublications.org)

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## PAPER PATTERN

- There will be separate question papers for Part 1 and Part 2 of 40 marks each.
- Duration of each paper will be 2 hours.

Question No.	Type of Questions	Total Marks
1.	(A) 5 Questions of 1 mark each (Objectives)	05
	(B) 5 Questions of 1 mark each (Practicals / Projects based MCQs)	05
2.	7 Questions of 2 marks each (solve any 5)	10
3.	7 Questions of 3 marks each (solve any 5)	15
4.	2 Questions of 5 marks each (solve any 1)	05

### Distribution of marks according to question type and aims

Sr. No.	Question type	Marks	Marks with option	% Marks
1.	Objective	10	10	25
2.	Very short answer	10	14	25
3.	Short answer	15	21	37.5
4.	Long answer	5	10	12.5
	<b>Total</b>	<b>40</b>	<b>55</b>	<b>100</b>

Sr. No.	Aims	Marks	Marks with option	% Marks
1.	Knowledge	10	10	25
2.	Understanding	10	15	25
3.	Application	16	25	40
4.	Skill	4	5	10
	<b>Total</b>	<b>40</b>	<b>55</b>	<b>100</b>

[Reference: महाराष्ट्र राज्य पाठ्यपुस्तक निर्मिती व अभ्यासक्रम संशोधन मंडळ, पुणे निर्मित मूल्यमापन आराखडा]

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Note: Textual exercise questions are represented by \* mark.

# 8 Cell Biology and Biotechnology



**Choose the correct alternative:**

1. In stem cell preservation, stem cells are kept in liquid nitrogen at \_\_\_\_\_ (-135 °C to -190 °C, -88 °C to -150 °C, 135 °C to 190 °C, 120 °C to 200 °C)
2. Which among the following organs can be taken from a live donor?  
(Heart, Kidney, Eyes, Liver)
3. A gene responsible for synthesis of vitamin \_\_\_\_\_ is introduced in Golden rice. (D, E, C, A)
4. Phenylketonuria is a genetic change in \_\_\_\_\_ cells.  
(skin, liver, heart, lungs)
5. Human Genome Project has helped in \_\_\_\_\_.  
(mapping the human genome, early detection of genetic diseases, identifying individuals involved in a crime, all of these)
6. \_\_\_\_\_ is produced from sugar molasses with the help of transgenic yeast. (Bread, Alcohol, Sweetener, Ice-cream)
7. The credit of the discovery of oil-digesting and fast multiplying bacteria goes to scientist \_\_\_\_\_ of Indian origin.  
(Dr. M.S. Swaminathan, Dr. Anand Mohan Chakravarti, Dr. Norman Borlaug, Dr. Verghese Kurien)

1 mark each

1-2 mins

-135°C to -190°C

Kidney

A

liver

All of these

Alcohol

Dr. Anand Mohan Chakravarti



**Fill in the blanks:**

1 mark each

1-2 mins

1. \_\_\_\_\_ are special type of cells present in the body of multicellular organisms.
2. Stem cells are present in \_\_\_\_\_ and adipose connective tissue of adult human beings.
- \*3. \_\_\_\_\_ is the revolutionary event in biotechnology after cloning.
4. Organ donation and transplantation is under the control of \_\_\_\_\_ Act 1994.
5. High-class varieties of crops have been developed through the technique of \_\_\_\_\_.
- \*6. Methods like artificial insemination and embryo transplant are mainly used for \_\_\_\_\_.

Stem cells

red bone marrow

Stem cell research

Transplantation of Human Organs

tissue culture

animal husbandry



- \*7. The disease related with the synthesis of insulin is \_\_\_\_\_.
- \*8. Government of India has encouraged \_\_\_\_\_ for improving the productivity by launching NKM-16 (Neel-Kranti Mission-2016).
- 9. India has a great tradition of \_\_\_\_\_ that cures the diseases with the help of natural sources.

diabetes

pisciculture

Ayurveda

#### For your understanding:

Pisciculture is also known as fish farming which refers to raising fish and other aquatic animals like prawns for commercial purpose.



#### Match the following:

½ mark for each correct match

⌚ 1-2 mins

1.

Column A	Column B
i. Interferon	a. Diabetes
ii. Factor VIII	b. Dwarfism
iii. Somatostatin	c. Viral infection
iv. Interleukin	d. Cancer
	e. Haemophilia

i - c

ii - e

iii - b

iv - d



#### Find the odd out:

1 mark each

⌚ 1-2 mins

1. Earthworm, frog, bollworm, insectivorous birds

A. **Bollworm – Frog, earthworm and insectivorous birds** are helpful in agriculture, whereas, bollworm is a pest affecting crop plants.

2. Rhizobium, Azotobacter, Nostoc, *Bacillus thuringiensis*

A. ***Bacillus thuringiensis*** – All others are organisms that help in nitrogen fixation, whereas ***Bacillus thuringiensis*** is used in the production of genetically modified crops.



#### Find out the correlation:

1 mark each

⌚ 1-2 mins

\*1. Insulin : Diabetes :: Interleukin \_\_\_\_\_

A. **Cancer – Correlation:** Insulin is used in the treatment against diabetes. Similarly, interleukin is used in the treatment against cancer.

\*2. Interferon : \_\_\_\_\_ :: Erythropoietin : Anemia

A. **Viral infection – Correlation:** Erythropoietin is the protein produced by biotechnology against anemia. Similarly, interferon is produced by biotechnology against viral infection.

\*3. \_\_\_\_\_ : Dwarfism :: Factor VIII : Haemophilia

A. **Somatostatin – Correlation:** Haemophilia is treated by protein Factor VIII. Similarly, dwarfism is treated by the hormone somatostatin.

4. Dr. M.S. Swaminathan : Green revolution :: Dr. Verghese Kurien : \_\_\_\_\_

A. **White revolution – Correlation:** Dr. M.S. Swaminathan was a pioneer in the initiation of green revolution. Similarly, Dr. Verghese Kurien was a pioneer in the initiation of white revolution.

\*5. White revolution : Milk production :: Blue revolution :

A. **Production of aquatic organisms – Correlation:** White revolution refers to production of milk on a large scale. Similarly, blue revolution refers to the production of aquatic organisms.



**Right or wrong:**  
Write the correct statement if wrong.

1 mark each | 1-2 mins

1. Zygote is formed by the union of male and female gametes.
2. Organs like heart, eyes can be donated even when the person is alive.  
*Correct - Organs like heart, eyes can be donated only after death.*
- \*3. Changes in genes of the cells are brought about in non-genetic technique.  
*Correct - Changes in genes of the cells are brought about in genetic technique.*
- \*4. Genes from *Bacillus thuringiensis* is introduced into soybean.  
*Correct - Gene from *Bacillus thuringienses* is introduced into cotton and brinjal.*  
*[Note: Gene from *Bacillus thuringiensis* has been introduced into various crops including soybean to produce Bt soybean.]*
5. In pharmacy, experiments for production of antibodies, vitamins and hormones like insulin have been successful due to biotechnology.
6. Vaccines produced with the help of biotechnology are more thermo stable and remain active for longer duration.
7. Genetically modified *Deinococcus radiodurans* is used to absorb the radiations from radioactive debris.

Right

Wrong

Wrong

Wrong

Right

Right

Right



**Name the Following:**

1 mark each | 1-2 mins

1. Research institute in India dedicated for research on cells
- A. National Centre for Cell Science at Pune and 'inStem' at Bengaluru

**For your understanding:**

inStem stands for Institute for Stem Cell Biology and Regenerative Medicine

2. Research centre for DNA fingerprinting
- A. Centre for DNA Fingerprinting and Diagnostics, Hyderabad
3. Hormones produced with the help of biotechnology
- A. Insulin and somatotropin



**Explain the following terms:**

1 mark each | 1-2 mins

1. **Cytology:** Study of the structure, types and organelles of the cell as well as study of cell division is called as cell biology/cytology.
2. **Vaccine:** Vaccine is the antigen containing material given to acquire either permanent or temporary immunity against a specific pathogen or disease.
3. **Cloning:** Production of replica of any cell or organ or entire organism is called cloning.
4. **Green revolution:** Various methods applied for harvesting maximum yield from minimum land are collectively called as green revolution.



### Solve the following questions:

1 mark each



1-2 mins

Can you recall? (page 88)

- What is cell?
- A. Cells are the structural and functional unit of the body of living organisms. It is the smallest unit in a living organism.
- Which technique in relation to tissues have you studied in earlier classes?
- A. Tissue culture technique which is used in biotechnology to develop new organism from the existing tissue was studied in earlier classes.

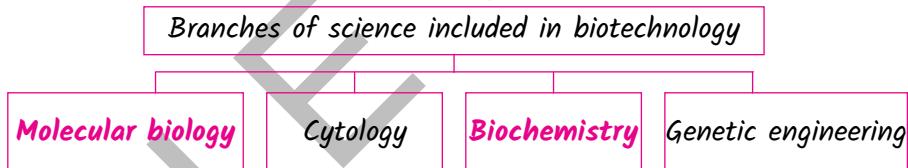
Recall A Little (page 91)

- What is biotechnology?
- A. The techniques of bringing about improvements in living organisms by artificial genetic changes and hybridization for the welfare of human beings are together called biotechnology.
- In which various fields, the biotechnology has been useful?
- A. In fields like agriculture, medicine, animal husbandry, environmental science etc. biotechnology has been useful.

1. Fill the boxes with appropriate answers:



A.



2. What are somatic cells?

- A. Cells present in the entire body except those present in gonads i.e. testis and ovary are called somatic cells.

3. What is the use of transgenic variety of tobacco?

- A. i. Indian Institute of Science has developed a transgenic variety of tobacco.  
ii. If cattle feed upon leaves of this plant, they do not contract viral disease rinderpest.

4. What is White Biotechnology/Industrial Biotechnology (Products)?

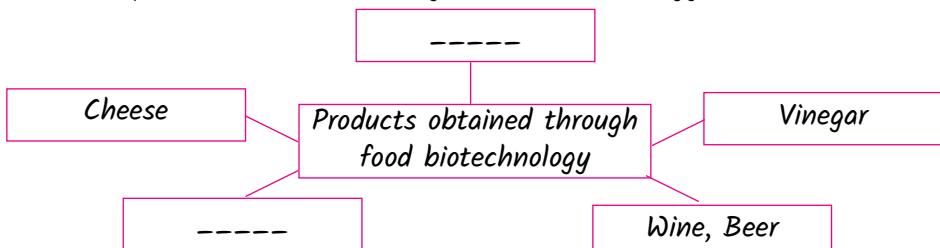
- A. i. Various industrial chemicals can be produced through less expensive processes. This is called as white biotechnology.  
ii. Example: Alcohol production from sugar molasses with the help of transgenic yeast.

#### Interesting fact:

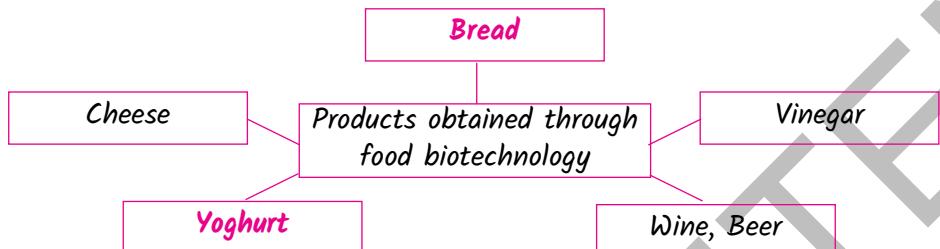
Industrial biotechnology is called as white biotechnology mainly in Europe. It is a means by which pollution can be lowered and industrial products can be obtained from less energy and generation of less waste.



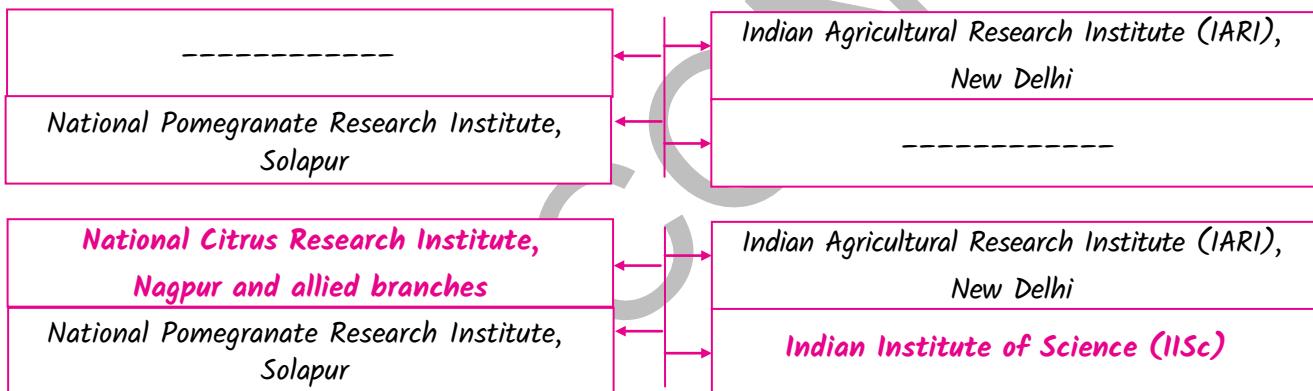
5. Fill the boxes with products obtained through food biotechnology:



A.



6. Some of the institutes of agriculture are:



7. Which new species of the rice have been developed in India? (Collect Information, page 97)

OR

Some of the new species of the rice developed in India are RP B10 226, \_\_\_\_\_, and HRI-152.

A. Some of the new species of the rice developed in India are RP B10 226, MTU 1075, UPR 2870 and HRI-152.

**For your understanding:**

Species of rice is *Oryza sativa*. There are several varieties of this species like those mentioned above.



Answer the following questions in brief:

2/3 marks each | 5-7 mins

Can you recall? (page 88)

➤ What is a tissue? What are the functions of tissue?

- A. 1. A group of cells having the same origin, same structure and same function is called a tissue.
2. Tissues perform different functions based on its type like contraction and relaxation of muscles, transportation of food and water in plants, protection and joining of different body parts etc.



➤ Which are the various processes in tissue culture?

- A. 1. Tissue culture is a biotechnological process in which a whole organism is formed from a single tissue.
2. Tissue culture includes several processes like:
  - i. Obtaining a sample of tissue from source plant/animal
  - ii. Primary treatment of the sample
  - iii. Reproduction/Multiplication
  - iv. Shootting and rooting
  - v. Primary hardening
  - vi. Secondary hardening several varieties of this species like those mentioned above.

1. Just like the grafting in plants, is the organ transplantation possible in humans?  
(Use your brain, page 89)

- A. i. In humans, organ transplant is possible where a damaged organ is replaced by an efficiently working healthy organ, just like grafting in plants.
  - ii. Example: In a person with both the kidneys damaged, kidney can be transplanted from a living donor like a relative with matching blood group and other vital aspects.
  - iii. Similarly, kidney can also be transplanted from a posthumous (after death) donor.
2. i. Write about a property of stem cells.
    - ii. In what are the collected samples of stem cells kept?
    - iii. At what temperature are the stem cells kept for preservation?
    - iv. What is the purpose of preserving stem cells?
  - A. i. Stem cells are the primary type of undifferentiated cells with self-multiplying ability and they are parent cells of all types of human cells. This property of stem cells is called as pluripotency.
  - ii. Collected samples of stem cells are kept in small, sterile vials.
  - iii. Stem cells are kept in liquid nitrogen at  $-135^{\circ}\text{C}$  to  $-190^{\circ}\text{C}$  for the purpose of preservation.
  - iv. Stem cells can be used in the future by the person from whom these stem cells were first harvested.

**For your understanding:**

Vials are small glass or plastic bottles that are used to store medicines.

3. Write in brief about adult stem cells?

- A. i. Stem cells obtained from an adult human are called as adult stem cells.
  - ii. There are three main sources of stem cells in adults – red bone marrow, adipose connective tissue and blood.
  - iii. Besides, stem cells can be obtained from cord blood immediately after birth.
4. i. Give the uses of stem cells in regenerative therapy.
    - ii. Give the uses of stem cells in organ transplantation.
  - A. i. Uses of stem cell in regenerative therapy:
    - a. Cell therapy: Stem cells are used to replace the dead cells in case of conditions like diabetes, myocardial infarction, Alzheimer's disease, Parkinson's disease etc.
    - b. To produce blood cells required in conditions like anemia, leukemia, thalassemia etc.
  - ii. Use of stem cell in organ transplantation:  
Organs like kidney and liver can be produced with the help of stem cells and transplanted.

**For your understanding:**

Myocardial infarction: In simple terms it is nothing else but heart attack. It results in stoppage of blood flow to the heart muscles. Alzheimer's disease: A disease in which there is loss of memory and hampers other mental functions.



**Recall a Little (page 91)**

- What is the impact of biotechnology on agriculture and other related fields?
- A. Crop yield has increased because of the use of biotechnology. In the field of agriculture with the help of tissue culture, plants can be grown in a less amount of time. Disease resistant plants are also developed by introducing genes in the target plants.

\*5. Which products produced through biotechnology do you use in your daily life?

- A. i. The use of biotechnology has increased, where almost all the necessary items are obtained through biotechnology.
- ii. Products like food grains are genetically modified crops which contain vitamins or any other nutrients at a much higher quantity than the naturally grown plants.
- iii. Dairy products like cheese, yoghurt, probiotics etc. are produced using microbial biotechnology.
- iv. Apart from food items, products like antibiotics, vaccines for several diseases that are now available are the products of biotechnology.
- v. Biofuels are also obtained through biotechnology which is useful in our daily life.

6. Name the institutes in India, working under the control of the department of biotechnology.

- A. Various institutes in India are working under the control of the department of biotechnology. It includes:
  - i. National Institute of Immunology
  - ii. National Facility for Animal Tissue and Cell Culture
  - iii. National Centre for Cell Science
  - iv. National Brain Research Centre
  - v. Central Institute of Medicinal and Aromatic Plants

7. i. Name the methods used in animal husbandry.

ii. What is the use of introducing foreign genes in target animals?

- A. i. In the field of animal husbandry methods like artificial insemination and embryo transfer are used.
- ii. Following are the uses of introducing foreign genes in target animals:
  - a. It helps to improve both the quality and quantity of animal products. Example - Milk, meat, wool etc.
  - b. Animals with more strength have been developed for hard work.

8. i. What is insulin?

ii. Why is there a need to inject insulin in diabetic patients?

iii. From where was insulin collected in earlier times?

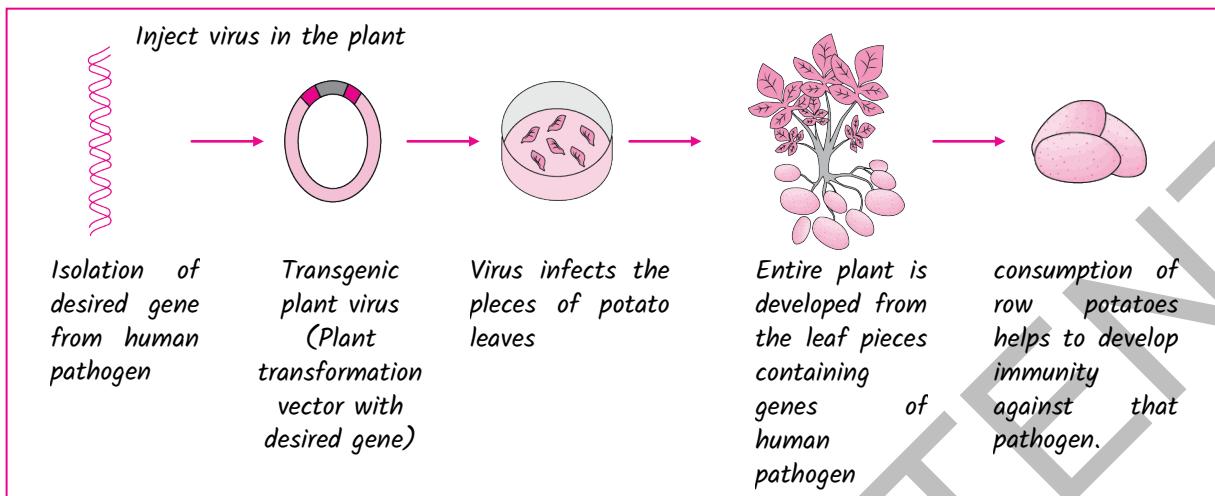
iv. Nowadays how is insulin produced?

v. What else can be produced in this manner?

- A. i. Insulin is a hormone which maintains blood glucose level and is used in the treatment of diabetes.
- ii. Patients with diabetes have insufficient insulin production in their body. As a result of this, insulin needs to be injected in diabetic patients to maintain blood glucose level.
- iii. Earlier, insulin was being collected from the pancreas of horses.
- iv. Nowadays, using biotechnology, insulin can be prepared with the help of bacteria. For this purpose, human insulin gene has been inserted into genome of bacteria.
- v. Various vaccines and antibiotics are also produced in the same manner by introducing desired gene in the genome of the bacteria.



9. Identify and explain the process given in the following diagram.



- A. i. The above given diagram is of the process of production of transgenic potatoes.
- ii. Currently edible vaccines are being produced with the help of biotechnology and transgenic potatoes are one such example of edible vaccines.
- iii. Following are the steps involved in the production of transgenic potatoes:
- Isolate the desired gene from the human pathogen against which immunity needs to be developed.
  - Transfer the desired gene in a plant virus genome thus forming a transgenic plant virus that carries the desired gene.
  - Let the transgenic plant virus infect potato leaves.
  - With the help of tissue culture, develop the entire plant from the infected leaf pieces that contain the desired gene.
  - The potatoes produced by this plant will now carry the desired gene that when consumed raw will help develop immunity against the pathogen (like *Vibrio cholerae* and *Escherichia coli* depending on the pathogen from which the gene was isolated).
10. What will happen if transgenic potatoes are cooked for consumption? (page 94)
- A. i. Transgenic potatoes contain the gene that is isolated from the human pathogen like *E. coli* against which immunity needs to be developed.
- ii. Heating these transgenic potatoes will result in denaturing of the protein which is coded by the desired gene.
- iii. As a result of this, its effect will also reduce, thus failing to develop immunity in that person.
- iv. Therefore, transgenic potatoes need to be consumed raw and not to be cooked before consumption.
- II. i. What are interferons?
- ii. Where are interferons produced naturally?
- iii. With the help of biotechnology, how are interferons produced?
- A. i. Interferon is a group of small sized protein molecule used in the treatment of viral diseases.
- ii. Interferons are produced naturally in blood.
- iii. Nowadays, with the help of biotechnology, interferons are produced with the use of transgenic *E. coli*.
- \*12. Which precautions will you take during spraying of pesticides?
- A. i. Pesticides are chemicals that are used to kill pest. They include insecticides, weedicides, herbicides etc.
- ii. Care has to be taken while using pesticides because of its chemical nature.



- iii. Following are the precautions one should take:
- Only recommended amount of pesticide should be sprayed.
  - Care should be taken that pesticide is not sprayed in the opposite direction to that of wind.
  - Containers used for mixing or storing pesticide should not be used for domestic purposes.
  - Animals or humans should not be allowed in the field immediately after spraying pesticide.

13. What does organic farming include?

- A. i. Organic farming includes complete ban on chemical fertilizers and pesticides.  
ii. It includes use of local, sturdy varieties and thereby helps maintain natural balance.

14. i. Which fruit processing industries you observe in your surrounding?

- ii. What is their effect? (Make a list and discuss, page 99)

- A. i. (Students can find and make a list of fruit processing industries in their surroundings)  
ii. a. Fruit processing industries generate a lot of waste, which if not properly treated could lead to several pollution related problems.  
b. Also, there is a lot of wastage of food involved in fruit processing.



**Give scientific reasons:**

2/3 marks each | 4-6 mins

1. Farmers are now opting for organic farming.

- A. i. The use of chemical fertilizers and pesticides has increased to a great extent.  
ii. These poisonous chemicals reach the human body through food and water.  
iii. This in turn adversely affects humans and also has damaging effects on the environment.  
iv. Various problems like soil fertility and pest infestation have also become a serious issue due to the use of chemical fertilizers and pesticides.  
v. So as to overcome all these problems, farmers are now opting for organic farming.

2. Medicinal plants are being cultivated.

- A. i. Indian citizens have established humble and strong relation with the nature.  
ii. India has a great tradition of Ayurveda that cures the diseases with the help of natural sources.  
iii. During earlier days, medicinal plants were collected from the forest.  
iv. However, due to depletion in forest area, medicinal plants are becoming rare.  
v. Hence, medicinal plants are being cultivated.



**Answer the following questions in detail:**

5 marks each | 10-12 mins

1. i. What are stem cells?

ii. What is differentiation?

iii. What are the sources of stem cells?

iv. What are the uses of stem cells?

A. i. At the start of development, organism is in the form of a mass of cells where each and every cell is similar to each other. These cells are called stem cells.

ii. a. During development of the embryo, stem cells can form any type of cell, different types of tissues and perform different functions in the body. This is called as the differentiation of stem cells.

b. However, once the tissues are formed, the cells in those tissues, at the most, can form same types of cells only. This is the case in each part of the body.

iii. Source of stem cells:

a. Stem cells can be found in the umbilical cord by which the fetus is joined to the uterus of the mother.

b. Stem cells can also be found in the blastocyst stage of embryo.



- c. In an adult, stem cells can be found in the red bone marrow, adipose connective tissue and blood.
- d. Stem cells from these sources like cord blood, red bone marrow or from the embryo (blastocyst) are carefully collected and stored for the purpose of preservation.
- iv. Uses: Stem cells are used for developing different types of tissues and to regenerate a damaged organ.

**Interesting fact:**

Stem cells are used for generation of new skin for burn victims. It is a much faster process than the typically followed process of growing skin elsewhere on the body which can take weeks to grow.

- 2. i. Name the types of stem cells.  
ii. What is embryonic stem cell?  
iii. Which organs are formed due to differentiation?  
iv. How many different types of cells are present in the human body?  
v. What will happen if stem cells are collected before the 14<sup>th</sup> day?
- A. i. There are two types of stem cells: Embryonic stem cells and Adult stem cells.  
ii. Embryonic stem cells are the stem cells that are found in the embryo stage. Embryonic cells before differentiation are called as embryonic stem cells.  
iii. Cells of different organs like osteocytes (bone cells), hepatocytes (liver cells), and neurons are formed due to differentiation.  
iv. 220 different types of cells are present in the human body that is formed from a single type of cells i.e. embryonic stem cells.  
v. It has been found that if the stem cells are collected well before the beginning of differentiation i.e. during 5<sup>th</sup>-7<sup>th</sup> day and cultured with certain biochemical stimulus in laboratory, as per the stimulus, they can transform themselves into desired type of cells, thereby tissues and finally into organs.
- 3. i. Why is organ transplantation important?  
ii. Why can certain organs of human body be easily donated?  
iii. What factors need to be taken into consideration during organ transplantation?  
iv. Why is posthumous donation of body and organs important?
- A. i. a. Various organs in the human body either become less efficient or completely functionless due to various reasons like ageing, accidents, infections, disorders, etc.  
b. Life of such a person becomes difficult or may even prove fatal under such conditions.  
c. However, if a person gets the necessary organ under such conditions, his life can be saved.  
d. Therefore, in such circumstances, organ transplantation becomes very important.  
ii. a. Availability of donor is an important requirement in organ transplantation.  
b. Each person has a pair of kidneys. As the process of excretion can occur with the help of single kidney, person can donate another one.  
c. Similarly, skin from certain parts of the body can also be donated.  
d. Hence, some organs like kidneys and skin from certain parts of the body can be easily donated.  
iii. Various factors like blood group, diseases, disorders, age, etc. of the donor and recipient need to be paid attention during transplantation.



- iv. a. There are some organs which cannot be donated during lifetime.  
 b. Organs like liver, heart, eyes can be donated only after death.  
 c. This has led to the emergence of concepts like posthumous (after death) donation of body and organs.

\*4. Why some of the organs in human body are most valuable?

- A. i. Human body is an amalgamation (combination) of different organs working together for the smooth functioning of the various life processes which are vital for life.  
 ii. Even though each organ has a unique and important part to play in the efficient working of a human body, organs like brain, heart, lungs, liver and kidneys are some of the vital organs of human body.  
 iii. Brain is the main CPU of the human body which controls all other vital life processes. The pituitary gland present in the brain controls the endocrine system of the body which in turn affects all other organs.  
 iv. Human heart is myogenic i.e. it works on its own with the help of cardiac muscles and pumps blood to the rest of the body.  
 v. Lungs present along with heart in the thoracic cavity are involved in respiration which supplies oxygenated blood and removes carbon dioxide ( $\text{CO}_2$ ) from the body.  
 vi. Liver is one of the most important organs of the body because of its ability to carry out different functions including production of bile which is necessary for digestion process, destruction of old RBC's, removal of toxic elements from the body etc. Liver has a very important role to play in the fetal stage, as it produces RBC's.  
 vii. Human kidney is important as it carries out excretion and osmoregulation which helps maintain osmotic balance in the body and also eliminates harmful substances out of the body.  
 viii. Apart from the vital functions these organs carry out, these organs can also be donated to a needy thus helping in saving someone's life.  
 ix. Organs like heart, eyes and liver can be donated after death (posthumous) of an individual, whereas some organs like kidney can be donated during the lifetime of an individual.  
 Hence, some of the organs in human body are most valuable.

**For your understanding:**

Endocrine system refers to secretion of hormones directly into blood which then has a specific effect on particular organs of the body in humans.

5. i. Write about the field of biotechnology?  
 ii. What are the main aspects of biotechnology?  
 A. i. a. Biotechnology brings about artificial genetic changes and hybridization in organisms for human welfare.  
 b. Various branches of science like cytology, biochemistry, molecular biology and genetic engineering are included in biotechnology.  
 c. There is considerable progress mainly in the field of agriculture and pharmacy due to biotechnology.  
 d. New experiments are being performed for improving the agricultural yield.  
 e. In pharmacy, experiments for production of antibodies, vitamins, and hormones like insulin have been successful. High-class varieties of crops have been developed through the technique of tissue culture.  
 ii. Following are the main aspects/areas of biotechnology:  
 a. Use of various abilities of microbes in yoghurt production from milk and alcohol from molasses.  
 b. Use of productivity of the cells.  
 Example: Production of antibiotics and vaccines, etc. with the help of specific cells.



- c. Use of biomolecules like DNA and proteins in human welfare.
- d. Development of plants, animals and products of desired quality by gene manipulation.
- e. Production of human growth hormone with the help of genetically modified bacteria.
- f. Use of genetic and non-genetic technique. Non-genetic biotechnology involves use of either cell or tissue. Example – Tissue culture, production of hybrid seeds, etc.



### Smart Recap:

- Biotechnology involves making changes in the genetic makeup of an organism.
- Branches: Cytology, microbiology, biochemistry, molecular biology and genetics.
- Advancements have been made in agriculture and medicinal fields.
- Biotechnology involves :
  - Use of microorganisms
  - Use of productivity of cells
  - Use of biomolecules like DNA, proteins etc.
  - Genetic manipulation for obtaining desired products from plants and animals. Genetic and non-genetic techniques

6. i. What is crop biotechnology?  
iii. What are hybrid seeds?  
iv. Write about some genetically modified crops. v. Write a note on biofertilizers.
- A. i. Biotechnology is used in agricultural field to improve yield and variety. This is called as crop biotechnology.  
ii. Crop biotechnology includes:
  - a. Hybrid seeds
  - b. Genetically Modified Crops (GM crops)
  - c. Biofertilizers  
iii. Genes of two different crops are recombined to form hybrids of various crops, which are called as hybrid seeds. This is especially useful for fruits.  
iv. a. Crops developed with desired characters by integrating foreign gene with their genome are called as Genetically Modified Crops.  
b. High yielding varieties with resistance to diseases, alkalinity, weeds and other stresses like cold and drought are developed with the help of biotechnology.  
c. Bt Cotton:
  - 1. A gene had been isolated from the bacterium *Bacillus thuringiensis* and integrated with the gene of cotton.
  - 2. Due to this, the toxin which is fatal for bollworm was produced in leaves and bolls of cotton.
  - 3. If bollworm feeds on leaves, the toxin destroys its alimentary canal and the bollworm dies.  
d. Bt Brinjal:
  - 1. Bt Brinjal variety is developed by using the gene isolated from *Bacillus thuringiensis*.
  - 2. This improved variety of brinjal kills the pest in the same way as the Bt cotton does.  
e. Golden Rice:
  - 1. A gene synthesizing the vitamin A (Beta carotene) has been introduced in this variety of rice.
  - 2. As compared to the normal variety, this variety which has been developed in 2005, contains 23 times more amount of beta carotene.  
f. Herbicide tolerant plants:
  - 1. Weeds always affect the growth of main crop. If herbicides are used to destroy the weeds, it affects the main crop too.
  - 2. Due to this, herbicide tolerant plant varieties of crops are being developed.
  - 3. It has become possible now to selectively destroy the weeds.



vi. Biofertilizers:

- Due to the use of biofertilizers instead of chemical fertilizers, nitrogen fixation and phosphate solubilisation abilities of the plants are improved.
- Mainly the bacteria like Rhizobium, Azotobacter, Nostoc, Anabaena and plants like Azolla are used as biofertilizers.

\*7. Explain the meaning of vaccination.

- i. Vaccine is the 'antigen' containing material given to acquire either permanent or temporary immunity against a specific pathogen or disease.
- Vaccination is a process by which vaccines are either injected or given orally to a person to develop immunity against a particular pathogen.  
Example: Polio virus is used against polio disease which is caused by poliovirus.
- From ages antigens were used in vaccines, where the disease causing pathogens were either completely or partially killed and then used in a vaccine.
- However, in these cases there were chances of the person not getting complete immunity from the vaccine and the antigen itself causing disease.
- Due to these reasons scientists made use of biotechnology to prepare artificial vaccines.
- For artificial vaccines, genes of disease causing pathogen were taken and antigenic preparation were made from it which was then used as a vaccine. This enabled efficient and safe vaccine production.
- Nowadays, completely or partially killed bacteria are not used as vaccines. Instead, proteins of the antigens in its pure form are used as vaccines.
- These protein vaccines develop immunity against a particular disease/pathogen in a person, and keep him/her disease free.
- These vaccines are safe and since they have high temperature withstanding capacity, they can survive for a longer duration. Example: Hepatitis vaccine.

**For your understanding:**

Vaccines actually provide immunity against a disease rather than curing a disease.

It is given before a person contracts a disease to build immunity i.e. it gives the body time to produce antibodies well in advance, so that if the person actually contracts that disease, body is already prepared to fight against it. This is because of memory T cells of the immunity system that remembers the previously encountered pathogens. They then instruct other cells of the immune system specifically Killer T cells and B cells (that produce antibodies) to fight against those pathogens.

8. i. What are the types of cloning?

ii. Explain Reproductive cloning.

iii. Explain Therapeutic cloning.

A. i. There are two types of cloning : Reproductive cloning

Therapeutic cloning

ii. Reproductive cloning:

- A clone can be produced by fusion of a nucleus of somatic cell with the enucleated ovum of anybody.

- Thus, there is no need of sperm to produce the new organism.

iii. Therapeutic cloning:

- Stem cells are also of use in medicinal fields for treating various diseases and in controlling the inheritance of certain diseases.

- Stem cells can be derived from the cell formed in laboratory by the union of somatic cell nucleus with the enucleated egg cell.



- c. Similar to cells, genes can also be cloned and millions of copies of same gene can be produced. Those can be used for gene therapy and other purposes.
  - d. Controlling the inheritance of hereditary diseases, continuation of generations, enhancing the specific tendency may become possible due to cloning technique.
9. i. Write a note on environment and biotechnology in regards with treatment of sewage waste.  
ii. How are microbes useful in waste management?  
iii. What new concepts are developed in biotechnological methods?  
iv. What is bioremediation? Give some examples to explain bioremediation.  
v. What is phytoremediation?
- A. i. a. It has become possible to solve environment related various problems with the help of biotechnology.  
b. Microbial techniques are already in use for treatment on sewage and solid waste.  
c. Sewage is rich in organic matter. If such sewage is released in natural water bodies like rivers, the organic matter present in it gets oxidized with the help of dissolved oxygen.  
d. Due to this, level of dissolved oxygen in water decreases, adversely affecting the aquatic life.  
e. As a remedy on this, sewage should be released into rivers only after oxidation with the help of microbial technique.
- ii. Microbes are useful on large scale in the production of compost by treating solid organic waste material.
- iii. Bioremediation, biopesticides, biofertilizers, biosensors, etc. are some of the new concepts in biotechnological methods.
- iv. Bioremediation means either absorption or destruction of toxic chemicals and harmful pollutants with the help of plants and microorganisms.
- Some examples of bioremediation are as follows:
- a. The *Pseudomonas* bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water.
  - b. The fern *Pteris vittata* can absorb the arsenic from the soil.
  - c. Genetically modified variety of Indian mustard can absorb selenium from soil.
  - d. Sunflower can absorb uranium and arsenic.
  - e. The bacterium *Deinococcus radiodurans* is highly radiation resistant organism. It has been genetically modified and used to absorb the radiations from radioactive debris.
- v. a. Grasses like alfalfa, clover and rye are used in phytoremediation.  
b. When plants are used for the purpose of bioremediation, it is called as phytoremediation.
10. i. What is DNA fingerprinting?  
ii. What is DNA fingerprinting useful for?  
iii. Give some of its application.  
iv. Where is DNA fingerprinting research carried out in India?
- A. i. DNA sequence of each person is unique as that of the fingerprints. Due to this, identity of any person can be established with the help of its available DNA. This is called as DNA fingerprinting.  
ii. DNA fingerprinting is mainly useful in forensic science.  
iii. Following are some of the applications of DNA fingerprinting:
  - a. Identity of the criminal can be established with the help of any part of its body found at the site of crime.
  - b. Similarly, identity of father of a child can be established with the help of DNA fingerprinting.

iv. In India, DNA fingerprinting research is performed in Centre for DNA Fingerprinting and Diagnostics, Hyderabad.

\*11. Write a comparative note on usefulness and harmfulness of biotechnology.

A. i. Usefulness/ benefits of biotechnology:

- a. It has become possible to increase the per hectare yield irrespective of the limitations of crop-land area.
- b. Expenses on disease control have minimized since development of resistant varieties.
- c. Due to development of fast fruit setting varieties, yield per annum has been increased.
- d. Development of stress resistant varieties which can withstand variable temperature, water-stress, changing fertility of soil, etc. has become possible.
- e. Different antibiotics and vaccines have been prepared by making use of biotechnology.

ii. Harmfulness /demerits of biotechnology:

- a. GM (Genetically Modified) crops though are loaded with nutrients; there is always a danger of containing allergens in it which can prove to be fatal. Therefore, products containing GM derived ingredients need to be mentioned in the labelling.
- b. Pesticide resistant crops do give us protection but it creates a much bigger threat of developing disease resistant bacteria which will not be affected by any pesticides in the near future.
- c. New genes are being introduced in animals which were not previously found in those animals. Thus, it creates an ethical issue about the brutality an animal has to undergo through biotechnology.

Due to these reasons, biotechnology is always a topic of debate on social, ethical and cultural aspects.

12. Give five examples of each of the fruiting and flowering plants developed through tissue culture and mention their benefits. (Make a list and discuss, page 93)

Name of the plant		Benefits
Fruits		
i.	Tomato (Flavr Savr TM tomato)	High content of lycopene gives it a red colour Improved thickness and texture Higher vitamin content and better taste
ii.	Strawberries (Still in developing stage)	Introduction of anti-freeze protein which will prevent it from getting frozen and mushy after removing from refrigerators.
iii.	Apples	They do not get brown
iv.	Papaya	Disease resistant
v.	Melon	Delayed ripening
Flowers		
i.	Carnations	Different colours that are not naturally available
ii.	Roses	Blue colour rose not available in naturally grown flower
iii.	Chrysanthemum	Insect resistance, flower colour modification, pollination control, etc.
iv.	Canola: Rapeseed, it is a bright yellow flowering plant. Used as cooking oil.	Herbicide tolerant
v.	Alfalfa: Perennial flowering plant belonging to pea family. Used as hay for cattle.	Herbicide tolerant



13. i. What are the types of fertilizers?  
ii. What is the benefit of use of manure?  
iii. What is the use of earthworm and fungi in farming?  
iv. What is used in hydroponics?  
v. What are the effects of use of chemical fertilizer?
- A. i. Two types of fertilizers that are used in agriculture are:  
a. Organic manure  
b. Chemical fertilizers  
ii. Water holding capacity of the soil improves with soil conservation due to use of manures.  
iii. a. Earthworms loosen the soil and their excreta serves as manure to the soil.  
b. Upper layer of the soil essential in agriculture is formed due to humus formation.  
c. Various essential elements like N, P, K can be available to crops due to earthworms and fungi.  
iv. In hydroponics i.e. soil-less farming, liquid chemical fertilizers are used.  
v. There are many harmful effects of liberal use of chemical fertilizers like decrease in the fertility of soil. The chemicals present in pesticides have been found to enter the food web and water sources causing adverse effects on humans and the environment.
- \*14. Explain the importance of fruit processing in human life?
- A. i. Fruit processing is one of the most rapidly growing industries in modern times.  
ii. Products like chocolate, juices, jam, jelly etc. are made from fruits through fruit processing.  
iii. Fruit processing helps in preservation of fruits, which can be consumed even during off seasons, when those fruits are not available in its natural form. Fruit processing methods range from cold storage to drying, salting, air tight packing, preparing murabba, evaporating, etc.  
iv. There is a scope for increase in employment opportunities because of development of food processing industries.  
v. Revenue from export of food processing products like jams and jellies also increases. Also, as these are preserved products they have a longer shelf life.



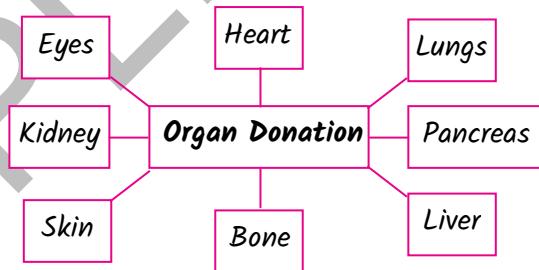
Write notes:

2 marks each



4-6 mins

1.



Write a note on the above given concept map.

- A. The above given concept map depicts organs that can be donated.

Organ and Body Donation:

- Concepts like organ donation and body donation have emerged recently after realization that such organs can be used to save the life of other needful persons.
- A liberal view behind the concept of organ and body donation is that after death, our body should be useful to other needful persons which can help save their lives. Awareness about these concepts is increasing in our country and people are voluntarily donating their bodies.
- Organ donation and transplantation is under the control of 'Transplantation of Human Organs Act, 1994' and subsequent amendments of 2009, 2011 and 2014 so that overall process would be transparent and any person would not be cheated.



- iv. Life of many people can be saved by organ and body donation. For instance, a blind person can benefit from an eye donation.
- v. Life of many people can be rendered comfortable by donation of organs like liver, kidneys, heart, heart valves, skin, etc.
- vi. Similarly, body can be made available for research in medical studies. Many government and social organizations are working towards increasing the awareness about body donation.

**Interesting fact:**

The first successful kidney transplant was performed in Boston (1954). The patient received a kidney from his identical twin.

**\*2. Biotechnology: Professional uses**

- A. i. The techniques of bringing about improvement in living organisms by artificial genetic changes and hybridization for the welfare of human beings are together called biotechnology. Following are the professional uses of biotechnology:
  - ii. Crop biotechnology: Biotechnology is used in agricultural field to improve yield and variety of the crops.
  - iii. Animal husbandry: Two main methods – artificial insemination and embryo transfer are used in animal husbandry. It helps to improve both, the quantity and quality of animal products.
  - iv. Human health: Diagnosis and treatment of the diseases are two important aspects of the human health management.
  - v. Industrial Biotechnology (Products)/ White biotechnology: Various industrial chemicals can be produced through less expensive processes.
  - vi. Environment and Biotechnology: It has become possible to solve environment related various problems with the help of biotechnology.
  - vii. Food biotechnology: Food items like bread, cheese, wine, beer, yoghurt, vinegar are produced with the help of microorganisms. These food items are probably the oldest ones produced with the help of biotechnology.
  - viii. DNA fingerprinting: DNA sequence of each person is unique as that of the fingerprints. Due to this, identity of any person can be established with the help of its available DNA. This is called as DNA fingerprinting. It is mainly useful in forensic sciences.

**3. Application of biotechnology in the field of human health**

- A. i. Diagnosis and treatment of the diseases are two important aspects of the human health management.
- ii. Biotechnology helps to identify the role of gene, if any, in disease of a person.
- iii. Diagnosis of diabetes and heart diseases has become possible even before the onset of symptoms, with the help of biotechnology.
- iv. Diagnosis of the diseases like AIDS, dengue can be done within few minutes. Thus, treatment can be done at the earliest.
- v. One of the examples of use of biotechnology in improving human health is the production of insulin for diabetic patients.

**4. Dolly sheep**

- A. i. Dolly sheep was the first somatic cell cloned mammal.
- ii. Dolly sheep was born in Scotland by cloning technique on 5th July 1996.
- iii. During this cloning technique, nucleus from the udder cell of 'Finn Dorset' variety of sheep was introduced into the enucleated ovum of Scottish sheep.



- iv. This ovum was then implanted and allowed to grow in the uterus of Scottish sheep and thereby 'Dolly' had been born.
- v. Characters shown by Dolly were as per the chromosomes in nucleus obtained from 'Finn Dorset' and any character of Scottish sheep was not visible.

**Interesting fact:**

Dolly gave birth to 6 lambs.  
1<sup>st</sup> year - 1 lamb - Bonnie  
2<sup>nd</sup> year - twins - Sally and Rosie  
3<sup>rd</sup> year - triplets - Lucy, Darcy and Cotton

**5. Green revolution**

- A. i. 20th century was marked with a rapid increase in population.
- ii. Almost all the countries, especially underdeveloped and developing countries had been badly affected by the effects of poor quality and quantity of food.
- iii. Various methods applied for harvesting maximum yield from minimum land are collectively called as Green revolution.
- iv. Dr. Norman Borlaug (USA) and Dr. M.S. Swaminathan (India) have valuable contribution in Green revolution.
- v. Improvised dwarf varieties of wheat and rice, proper use of fertilizers and pesticides and water management has led to the increased production of food grains and thereby, large population had been saved from hunger.
- vi. Various research institutes and laboratories are engaged in development of new varieties of various crops through research.

Example - Indian Agricultural Research Institute (IARI), New Delhi, National Citrus Research Institute, Nagpur and allied branches, Indian Institute of Sciences, National Pomegranate Research Institute, Solapur.

**6. White revolution**

- A. i. Dr. Verghese Kurien was a pioneer in starting white revolution.
- ii. Various parts of India were rich in milk and milk products. However, those products were not sufficient to meet the needs of the far-flung regions.
- iii. Dr. Verghese Kurien proved through the cooperative movement and use of biotechnology that dairy will not be allied but it will be a mainstream business.
- iv. He put the cooperative dairy movement of Anand, Gujarat at all time high status.
- v. While achieving the self-sufficiency in dairy business, various experiments were performed for quality control, newer dairy products and their preservation.

**7. Blue revolution**

- A. i. Production of various useful aquatic organisms with the help of water is called as blue revolution.
- ii. Farm ponds and the fishes are very common in East Asian countries. However, people are not only thinking of cultivating the fishes and shrimps but other aquatic plants and animals too.
- iii. Government of India has vowed to increase the production by encouraging the people for pisciculture by launching the program 'Neel-Kranti Mission-2016' (NKM-16).
- iv. 50% to 100% subsidies are offered in this case.
- v. Marine and fresh water fishery is possible on large scale.
- vi. Fresh water fishes like Rohu, Catla and other fishery products like shrimp and lobsters are being cultured on large scale.



### 8. Harmful effects of insecticides

- Though the natural immunity of plants can prevent the infections, use of insecticides is not under control.
- Irrespective of the natural predators like frogs and insectivorous birds, pesticides are used on large scale for increase in yield.
- Pesticides are in fact a type of poison.
- This poison enters the food web through water and food leading to biomagnification.
- Various pesticides like DDT, malathion, chlorpyrifos, etc. have been proved to be dangerous.

#### Interesting fact:

Several countries have banned the use of DDT because of its harmful effect on the environment. Countries like Canada, Finland, Hong Kong, Japan, Norway, USA etc. have put a ban on the use of DDT.

### \*9. Importance of medicinal plants

- Medicinal plants are those which have medicinal properties and provide temporary relief or permanent cure from ailments.
- Following are some of the important applications of medicinal plants:
  - Medicinal plants like black pepper, cinnamon etc. help in healing wounds.
  - Medicinal plants like herbs are used to purify blood.
  - Herbs also help boost immunity of a person, thereby reducing the chances of contracting diseases.
  - Medicinal plants like turmeric inhibit the growth of harmful microbes. Turmeric is added in Indian food for imparting taste and also because of its antibiotic properties.
  - Some medicinal plants also act as antacids and helps reduce the acidity level in the human body.

 Complete the paragraph with the help of appropriate options given in the bracket:

3 marks

⌚ 5-7 mins

- (phytoremediation, uranium, *Pseudomonas*, selenium, arsenic, bioremediation, *Methanococcus*, mercury)

\_\_\_\_\_ means either absorption or destruction of toxic chemicals and harmful pollutants with the help of plants and microorganisms. If plants are used for this purpose, it called as '\_\_\_\_\_. Some examples of bioremediation are as follows:

The \_\_\_\_\_ bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water. The fern *Pteris vittata* can absorb the \_\_\_\_\_ from the soil. Genetically modified variety of Indian mustard can absorb \_\_\_\_\_ from soil. Sunflower can absorb \_\_\_\_\_ and arsenic.

- Bioremediation means either absorption or destruction of toxic chemicals and harmful pollutants with the help of plants and microorganisms. If plants are used for this purpose, it called as 'phytoremediation'. Some examples of bioremediation are as follows:

The *Pseudomonas* bacteria are useful for cleaning the hydrocarbon and oil pollutants from soil and water. The fern *Pteris vittata* can absorb the arsenic from the soil. Genetically modified variety of Indian mustard can absorb selenium from soil. Sunflower can absorb uranium and arsenic.

#### Read the paragraph and answer the questions based on it:

5 marks ⌚ 10-12 mins

**Genetically Modified Crops:** Crops developed with desired characters by integrating foreign gene with their genome are called as *Genetically Modified Crops*. High yielding varieties with resistance to diseases, alkalinity, weeds other stresses like cold and drought.



**Bt Cotton:** A gene had been isolated from the bacterium *Bacillus thuringiensis* and integrated with the gene of cotton. Due to this, the toxin which is fatal for bollworm was produced in leaves and bolls of cotton. If bollworm feeds on leaves, the toxin destroys its alimentary canal and the bollworm dies.

**Bt Brinjal:** Bt Brinjal variety is developed by using the gene isolated from *Bacillus thuringiensis*. This improved variety of brinjal kills the pest in same way as the Bt cotton does.

**Golden Rice:** A gene synthesizing the vitamin A (Beta carotene) has been introduced in this variety of rice. As compared to the normal variety, this variety which has been developed in 2005 contains 23 times more amount of beta carotene.

1. What is genetically modified crop?

A. Crops developed with desired characters by integrating foreign gene with their genome are called as genetically modified crops.

2. Do changes occur in gene structure naturally? If yes what is the phenomenon called?

A. Yes changes do occur in gene structure naturally and the phenomenon is called mutation.

3. Name the vegetables rich in vitamin A.

A. Vegetables like carrots, spinach, peas, onion etc. are rich in vitamin A.

4. Why does Bt cotton prove to be fatal to bollworm that feeds on it?

A. *Bacillus thuringiensis* is a parasite of bollworm. Bt cotton consists of a gene isolated from *Bacillus thuringiensis*, which codes for a toxin. Bollworm feeding on it gets killed due to the toxin that is produced from the newly introduced gene of *Bacillus thuringiensis*.

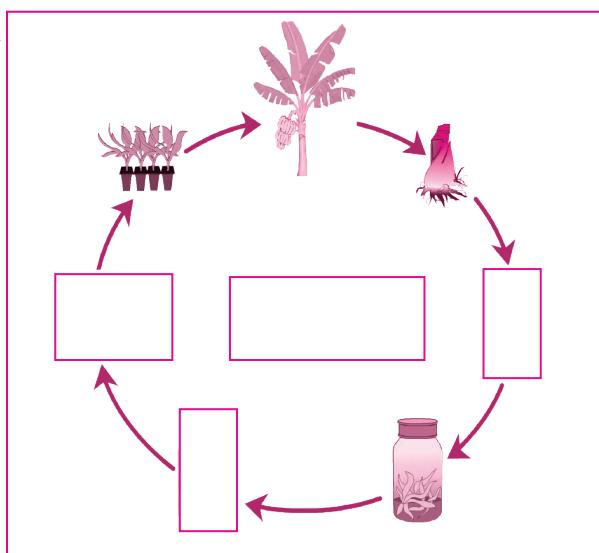
5. Are genetically modified crops beneficial to farmers?

A. Genetically modified crops are definitely beneficial to farmers as these are mostly disease resistant and help to save the yield. At the same time, it has its own disadvantages. For instance, insects can become resistant to such plants and thus, hampering the yield of crops in future.



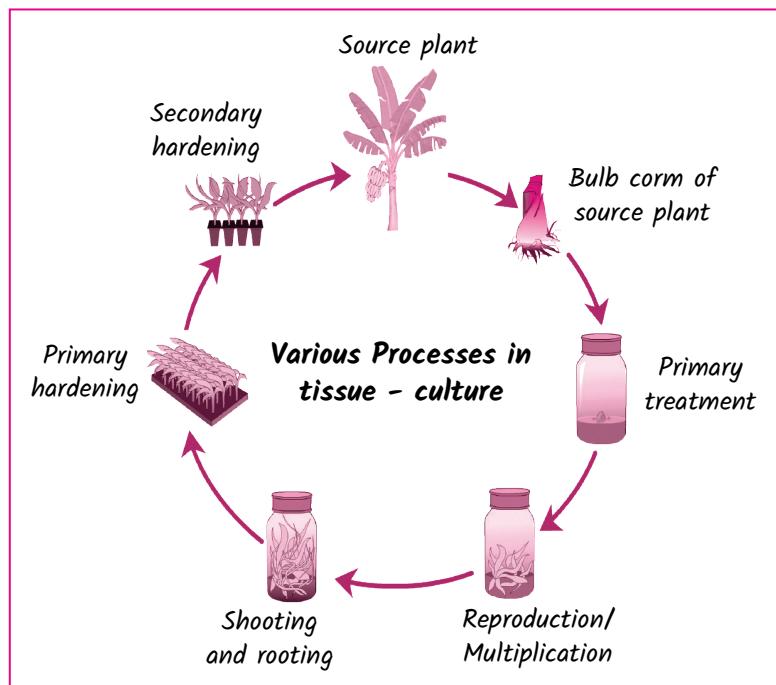
### Miscellaneous questions:

1. Assign names in the figure given below. Explain the various stages that are kept blank.  
(Observe, page 88)



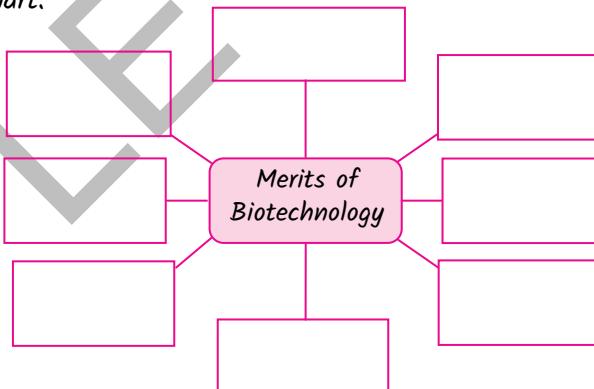


A.

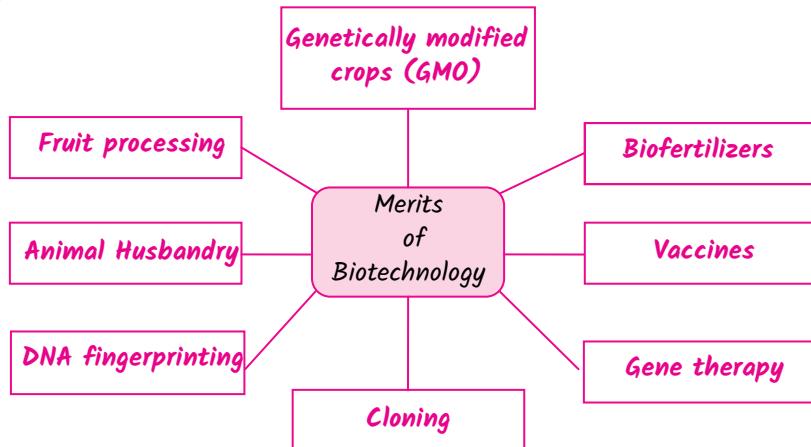


- i. Tissue culture is a biotechnological process in which a whole organism is formed from a single tissue.
  - ii. Tissue culture includes several processes like:
    - a. Obtaining a sample of tissue from source plant/animal
    - b. Primary treatment of the sample
    - c. Reproduction/Multiplication
    - d. Shootting and rooting
    - e. Primary hardening

\*2. Complete the following chart:



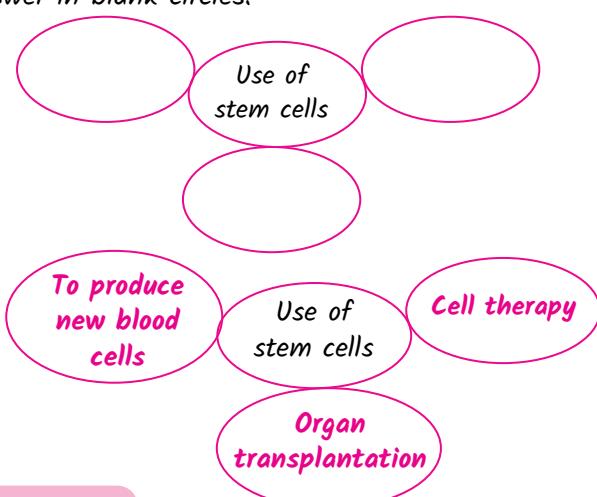
A.





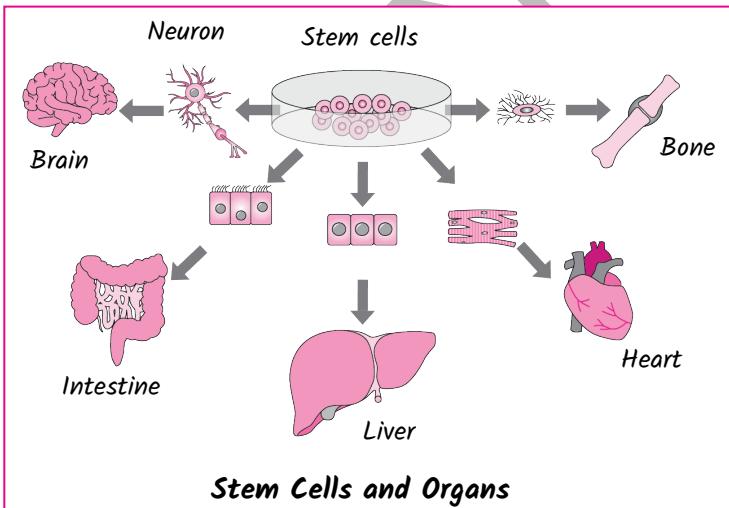
\*3. Write the correct answer in blank circles:

A.



Students' own response:

1. Discuss about stem cells and organ transplantation in the class with the help of figures given below. (Observe, page 90)



2. Visit the websites- <http://www.who.int/transplantation/organ/en/> & [www.organindia.org/approaching-the-transplant/](http://www.organindia.org/approaching-the-transplant/) and collect more information about 'brain dead', organ donation and body donation. (Internet is my friend, page 90).
3. Collect information about various hybrid varieties of animals. What are their benefits? Make a presentation of various pictures and videos. (Use of ICT, page 93)
4. Collect more information about the Human Genome Project, one of the important projects in the world. (Internet My Friend, page 95)
5. Collect the information and make the chart about the work of various state and national-level institutes related with biotechnology. (Internet is My Friend, page 97)
6. Bring a packet of 'Balghuti' from ayurveda shop. Learn the information about each component in it. Collect information about various other medicines and prepare a chart. (Try this, page 99)
- \*7. Visit the organic manuring projects nearby your place and collect more information. (Project, page 100)
- \*8. What will you do to increase public awareness about organ donation in your area? (Project, page 100)
- \*9. Collect information about 'green corridor'. Make a news-collection about it. (Project, page 100)



## TEST YOUR UNDERSTANDING

Time: 1 hour 15 mins

Total marks: 25 marks

**Q1. (A) Solve the following questions:**

(3 marks)

- i. Fill the boxes with appropriate answers:



- ii. Find out the difference between two: White revolution and Blue revolution

- iii. Which of the following units is different from the others? Why?

Rhizobium, Azotobacter, Nostoc, Bacillus thuringiensis

**(B) Choose the correct alternative and rewrite the statement:**

(2 marks)

- i. Gene of vitamin \_\_\_\_\_ is introduced in Golden Rice.

(A) beta-carotene

(B) cholecalciferol

(C) phylloquinone

(D) tocopherol

- ii. \_\_\_\_\_ is produced from sugar molasses with the help of transgenic yeast.

(A) Bread

(B) Alcohol

(C) Sweeteners

(D) Ice-creams

**Q2. Solve the following questions:**

(4 marks)

- i. Which are the various processes in tissue culture?

a. What is DNA fingerprinting?

b. What is DNA fingerprinting useful for?

c. Where is DNA fingerprinting research carried out?

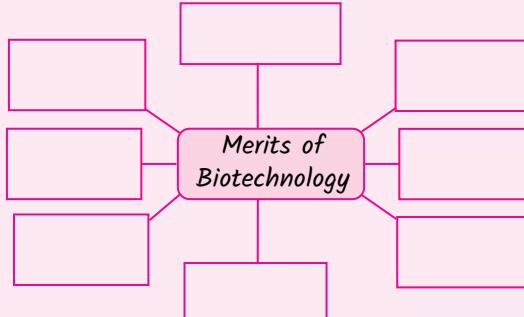
- ii. a. What property do stem cells have?

b. Name the sources of stem cell from where they can be collected for preservation?

**Q3. Solve the following questions:**

(6 marks)

- i. Write about green revolution.



- ii. Name some institutes of agriculture.

**Q4. Solve the following questions:**

(10 marks)

- i. Complete the following chart:

- ii. a. Why is organ transplantation important?

b. Why can certain organs of human body be easily donated?

c. What factors need to be taken into consideration during organ transplantation?

d. Why is posthumous donation of body and organs important?



# Std. X

## Smart Notes



### AVAILABLE SUBJECTS:

- Geography
- History and Political Science
- Science and Technology-I
- Science and Technology-II

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### SALIENT FEATURES:

- Extensive coverage of all textual content by its classification into varied questions and their answers
- Inclusion of 'Smart Recap' sections to reinforce key concepts
- Chapter-wise assessment at the end of every chapter to facilitate knowledge testing
- Model Activity sheet incorporated at the end of the book to acclimatise students with the nature of S.S.C. Boards Examination