

SCIENCE 2 BOARD QB

Question 4 (5 marks)

1. Explain any five types of evidence that support the theory of evolution.

- Ans. i. **Morphological evidence:** Various similarities like structure of mouth, position of eyes, structure of nostrils, ear pinnae and thickly distributed hair on body are seen in animals. Similarities in characters like leaf shape, leaf venation, leaf petiole, etc. occur in case of plants. This indicates that there are some similarities in those groups and hence it proves that their origin must be same and must have common ancestors.
- ii. **Anatomical evidence:** There doesn't seem any superficial similarity between human hand, foreleg of ox, flipper of whale and patagium of bat. Similarly, use of each of those structures is also different. However, there is similarity in structure of bones and joints in organs of each of those animals. This similarity indicates that those animals may have common ancestor.
- iii. **Vestigial organs:** Degenerated or underdeveloped useless organs of organisms are called as vestigial organs. Such organs, though non-functional in certain organisms, may be functional in other organisms. Appendix, which is useless to human, is useful and fully functional organ in ruminants. Similarly, muscles of ear pinna, which are useless to human, are useful in monkeys for movement of ear pinna. Various vestigial organs like tailbone (coccyx), wisdom teeth, and body hairs are present in body of human being.
- iv. **Paleontological evidence:** Large number of organisms get buried due to disasters like flood, earthquake, volcano, etc. Remnants and impressions of such organisms remain preserved underground. These are called as fossils. Study of fossils is an important aspect of study of evolution.
- v. **Connecting links:** Connecting links are plants and animals that show morphological characters by which they can be related to two different groups. Ex. In *Peripatus*, characters like segmented body, thin cuticle, and parapodia-like organs are present. Similarly, these animals show tracheal respiration and open circulatory system similar to arthropods. This indicates that *Peripatus* is connecting link between annelida and arthropoda. Similarly, duck billed platypus lays eggs like reptiles but shows relationship with mammals too due to presence of mammary

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glands and hairs. Lung fish performs respiration with lungs irrespective of being fish. These examples indicate that mammals evolved from reptiles and amphibians from fishes.

- vi. **Embryological evidence:** Comparative study of embryonic developmental stages of various vertebrates show that all embryos show extreme similarities during initial stages and those similarities decrease gradually. Similarities in initial stages indicate the common origin of animals.

[Any five types of evidence]

2. Explain in short- transcription and mutation.

Ans. a. **Transcription:**

- i. Transcription is the process of synthesis of mRNA from DNA. It takes place in the presence of RNA polymerase.
- ii. During transcription, mRNA is produced as per the sequence of nucleotides present on the DNA.
- iii. Only one of the two strands of DNA is used in this process.
- iv. This mRNA sequence is always complementary to the DNA strand that is used for its synthesis.
- v. There is uracil in RNA instead of thymine of DNA.

- b. **Mutation:** Mutation is any sudden change that occurs in the nucleotide sequence of a gene, causing either a minor or considerable change in the characters of an individual.

3. Write the reasons why the theory of gradual development of living organisms is followed by all.

- There are various theories of evolution but the most acceptable one is the theory of 'Gradual development of living organisms'.

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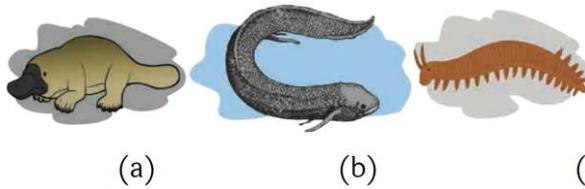
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- According to this theory, the first living material which is the protoplasm was formed in ocean. Gradual changes resulted in the formation of unicellular organisms and further developments resulted in the formation of larger and complex organisms.
- However, these changes did not occur overnight, they were slow and gradual changes which took almost 300 crore years.
- **There are various evidences which support evolution:**
 1. **Morphological evidence** - Similarity in morphological features of animals and plants is evidence that they have evolved from common ancestors. For example: In animals, similarities like structure of mouth, position of eyes, structure of nostrils and in plants, similarities in characters like leaf shape, leaf venation, leaf petiole represent common ancestry.
 2. **Connecting links** - Connecting links are plants and animals which show characteristics related to two different groups. For example, Peripatus is considered a connecting link between Annelida and Arthropoda. It has characteristics like segmented body, thin cuticle, and parapodia-like organs which are similar to annelids. It also shows tracheal respiration and open circulatory system which is similar to arthropods. Another example is duck billed platypus which is a connecting link between reptiles and mammals because it lays eggs like reptiles and has mammary glands like mammals.
 3. **Embryological evidence** - Embryology is used as one of the evidences of evolution. Comparative study of embryos shows that there is lot of similarity in them at the initial stages and this similarity decreases gradually. This similarity in the development of embryos represents common origin of organisms.
 4. **Anatomical evidences** - The bone structure of a human arm, a bull's leg, a bat's wing, and a whale's fin have similarities indicating that they have developed from common ancestors.
 5. **Vestigial organs** - Tailbone or coccyx present in humans indicate common ancestry between humans who have lost a tail and monkeys who have a tail.

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4. Write the answers to the questions by observing the figure below.



- Write the name of the animal 'A' in the figure.
- Write the name of the animal 'B' in the figure.
- Write the name of the animal 'C' in the figure.
- Which evolutionary evidence is illustrated by this figure?
- Write the definition of that evidence for evolution.

- Ans.
- 'A' - Duck billed platypus
 - B' - Lungfish
 - 'C' - Peripatus
 - The evolutionary evidence illustrated in the given figure is connecting links.
 - Definition: Connecting links are some plants or animals that show morphological characters by which they can be related to two different groups of organisms.

5. Write the expanded form of the names FAD, FMN, NAD, NADP, ATP.

Ans. Here are the expanded forms:

- FAD:** Flavin Adenine Dinucleotide
- FMN:** Flavin Mononucleotide
- NAD:** Nicotinamide Adenine Dinucleotide
- NADP:** Nicotinamide Adenine Dinucleotide Phosphate
- ATP:** Adenosine Triphosphate

6. Draw neat and labelled diagrams.

- Double fertilisation in angiosperms
- Human male reproductive organs.

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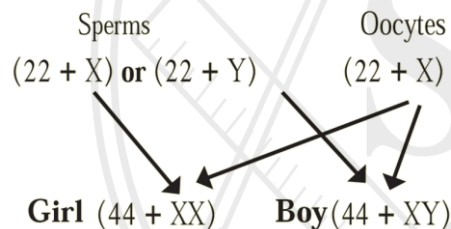
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- c. Spore formation
- d. Human female reproductive system

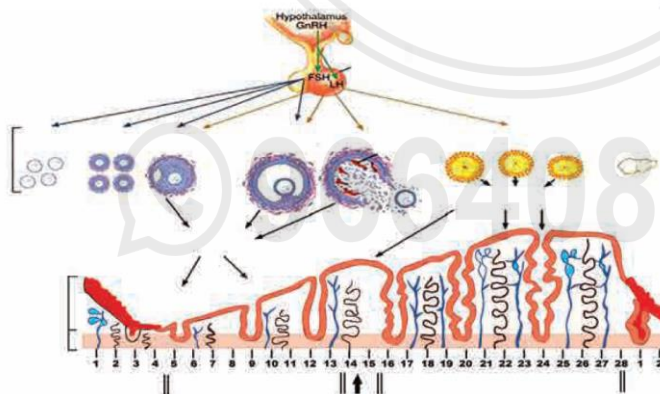
Ans. Practice diagrams from textbook.

7. How is it determined whether it will be a boy or a girl?

- Ans.**
- The chromosome number in germ cells producing the gametes are diploid i.e. $2n$.
 - It includes 22 pairs of autosomes and 1 pair of sex-chromosomes i.e. $(44 + XX)$ or $(44 + XY)$.
 - These germ cells divide by meiosis. Due to this, gametes contain only haploid (n) number of chromosomes i.e. $(22 + X)$ or $(22 + Y)$.
 - Two types of sperms are produced as $(22 + X)$ or $(22 + Y)$ whereas oocytes are produced of only one type as $(22 + X)$.



8. Write the answers to the following questions by observing the figure below.



Ans. i. What does the figure above show?

Ans. The given figure represents the menstrual cycle in females.

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ii. Which organs are involved in this process?

Ans. Uterus and ovaries are involved in menstrual cycle.

iii. Which hormones are involved in this process?

Ans. Menstrual cycle is controlled by four hormones: follicle stimulating hormone (FSH), luteinizing hormone (LH), estrogen and progesterone.

iv. After how many days do these changes happen again?

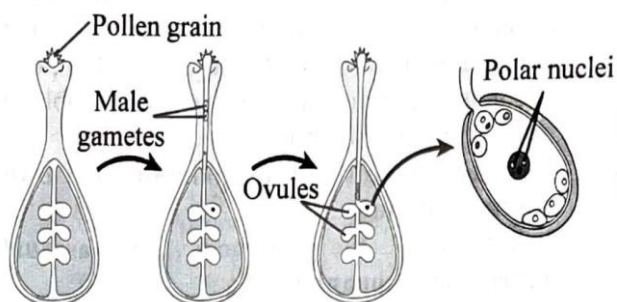
Ans. After at an interval of every 28-30 days changes happen again.

v. Explain your opinion about the statement that a woman's body is impure while the above process is going on.

Ans. It is a long-standing myth in various cultures that menstrual blood is impure and that women who is menstruating are unclean and unhygienic. However, there is no truth to this myth as menstruation is a natural process in which endometrial tissue and unfertilized ovum are expelled through the vagina. The menstrual cycle is not something to be ashamed of and should not be considered as unclean or impure, rather women should be encouraged to keep themselves hygienic and cleaner as the bodily changes can make them more susceptible to infections. Hence, creating awareness in the society regarding the taboo around the menstruation is essential.

9. Explain the sexual reproductive process in plants with a diagram.

Ans. Sexual reproduction in plants:

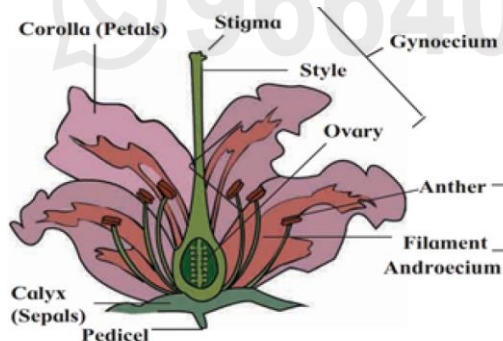


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- i. A flower is the functional unit of sexual reproduction in plants.
- ii. The androecium and gynoecium are the male and female parts of the flower respectively.
- iii. The female reproductive organ of a flower which gives rise to egg or female gamete is known as carpel. Ovary present at the base of the carpel contains ovules that undergo meiosis to form embryo sac.
- iv. Stamen is the male reproductive part of a flower which gives rise to male gametes.
- v. In sexual reproduction of plants, pollination is a major step, which involves the transfer of pollen grains on the stigma of female flower.
- vi. Stigma becomes sticky during pollination.
- vii. The pollen grain germinates over the stigma and gives rise to pollen tube.
- viii. Pollen tube carries two male gametes which are released near egg cell present in the embryo sac.
- ix. One male gamete fuses with a female gamete giving rise to zygote. The second male gamete fuses with two polar nuclei giving rise to endosperm. This is called as double fertilization.
- x. Zygote develops into embryo and endosperm serves as a nutritive tissue for the growing embryo.
- xi. After fertilization, the ovule develops into seed and ovary into fruit. Seeds fall upon the ground and can develop into a new plant under favourable conditions.

10. Observe the figure below. Write functions of the labelled parts.



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- Ans.**
- i. Gynoecium (Carpel): It is an essential whorl. It consists of stigma, style and ovary. It acts as a female reproductive part of the flower. It is responsible for production of female gametes.
 - ii. Androecium (Stamen): It is an essential whorl. It consists of anther and filament. It acts as a male reproductive part of the flower. It is responsible for production of male gametes.
 - iii. Calyx and corolla: Calyx and corolla are accessory whorls. They are responsible for protection of inner (essential) whorls.
 - iv. Pedicel: Pedicel is a small stalk which supports the flower.

11. Read the following paragraph and write the answers to the questions based on it.

Reproduction is an important process for the survival of an organism. Asexual reproduction occurs in different ways in plants. E.g., Vegetative propagation, fragmentation, budding, spore formation etc. Gametes are formed for sexual reproduction. In the animal kingdom, various methods like budding, binary fission, and parthenogenesis are used. There is no difference between males and females in the animals in which these methods are observed.

The method of regeneration also creates new organisms. But regeneration is not the real method of reproduction. Regeneration is the process of healing wounds, creating new organs.

This ability has completely disappeared in the developed animals. Modern research is being done on the method of sexual reproduction, e.g. Cloning. So in the future women will be able to create their own offspring without a father.

- i. **How do living organisms maintain their own species continuity?**
- ii. **What are the methods of asexual reproduction in animals?**
- iii. **Why is it said that regeneration is not the real method of reproduction?**
- iv. **What are the different methods of reproduction in plants?**
- v. **What modern breeding methods are being researched in developed animals?**

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- Ans.**
- i. Through the process of reproduction living organisms are able to maintain the continuity of their own species.
 - ii. Budding, binary fission and parthenogenesis are some of the methods of asexual reproduction in animals.
 - iii. Regeneration is the process of healing wounds, creating new organs. This ability is very limited in the developed (higher) animals. Hence, regeneration is not the real method of reproduction.
 - iv. Vegetative propagation, fragmentation, budding, spore formation are the different methods of reproduction in plants.
 - v. Embryo transfer, artificial insemination are the breeding methods being researched in developed animals.

12. 'Surrogacy, In Vitro Fertilisation (IVF), Sperm Bank/ Semen Bank etc. modern technology will be useful to humans.' Support this statement.

- Ans.**
- i. Childless couples can have a child with the help of advanced medical techniques like surrogacy, sperm bank and IVF.
 - ii. **In Vitro Fertilization (IVF)**
Fertilization is brought about in the test-tube and the embryo formed is implanted in uterus of woman at appropriate time. IVF technique is used for having the child in case of those childless couples who have problems like less sperm count, obstacles in oviduct, etc.
 - iii. **Surrogacy**
Some women have problems in implantation of embryo in uterus. Such women can take the help of the modern remedial technique called as surrogacy. In this technique, oocyte is collected from the ovary of the woman having problem in implantation in uterus. That oocyte is fertilized in test-tube with the help of sperms collected from her husband. The embryo formed from such fertilization is implanted in the uterus of some other woman having normal uterus. Such a woman, in whose uterus the embryo is implanted, is called as surrogate mother.

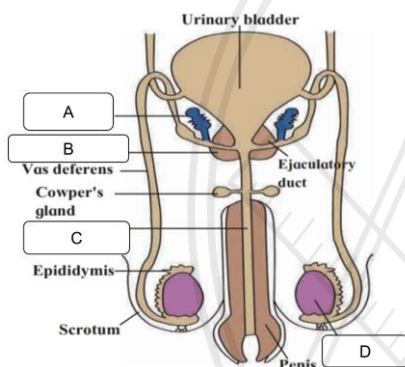
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iii. **Sperm Bank/ Semen Bank**

There are various problems in sperm production in case of many men. To have children in case of such couples, new concept of sperm bank has been introduced. This concept is similar to blood bank. Semen ejaculated by the desired men is collected after their thorough physical and medical check-up and stored in the sperm bank. As per the wish of the needful couple, oocyte of the woman is fertilized by IVF technique using the semen from sperm bank. Resultant embryo is implanted in the uterus of same woman.

13. **Write the answers to the questions by observing the figure.**



- What does the above figure show?
- Write the names of parts A, B, C, D.
- Write the function of the part 'D'.
- How is semen formed?

- Ans.**
- The given figure represents the human male reproductive system.
 - A: Seminal vesicle

B: Prostate gland

C: Urinogenital duct

D: Testis
 - The part labelled as 'D' is testis which is responsible for sperm production.
 - Semen is formed of sperms and secretions of seminal glands, prostate gland and Cowper's glands.

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14. i. What process does the next figure show?



- ii. Describe in short that process.
iii. Who can benefit from this process?

- Ans.** i. The process represented in the given figure is in vitro fertilization.
ii. IVF is a technique in which fertilization is brought about in the test tube. Sperm is injected into the ovum using a micropipette.
The embryo formed after fertilization is implanted in the uterus of a woman at the appropriate time.
iii. Childless couples, who have problems like less sperm count, obstacles in oviduct, etc., can use IVF technique for having a child.

15. i) Explain my role in the environment based on the following points. (Write two actions each)
- a) Control b) Conservation c) Production
d) Preservation e) Awareness
- ii) What initiatives will you take regarding environmental conservation? Write how.
- iii) What are the endangered species of animals and plants? How can they be saved?

- Ans.** i. a. Control
1. I will use water and other natural resources in only limited required quantity.
 2. I will stop the harmful activities like throwing garbage on road or public places.

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b. Conservation

1. I will help in conserving the available resources.
2. I will protect plants and animals in my locality.

c. Production

1. I will work for revival of environmental factors.
2. I will try to develop projects for conservation of special species.

d. Preservation

1. I will find remedies to prevent further loss of environment.
2. I will try to preserve unknown regions.

e. Awareness

I will spread awareness through education, guidance, participation in various activities.

- ii. a. Projects on collection of plastic wastes for recycling, conservation of biodiversity, tree plantation program etc., can be carried out for environmental conservation.

b. These projects can be carried out in the following ways:

1. Explaining the adverse effects of use of plastic on environment.
Explaining proper disposal and management of waste to people.
 2. convincing people about the importance of trees and the need to participate in tree plantation campaign.
 3. Making posters that provide more information about environment conservation, saving energy and other natural resources to raise public awareness.
 4. Organizing seminars in which environmentalists will guide students about environment conservation.
 5. Spreading awareness through celebrating earth day and environment protection day.
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- iii. **Endangered species:** These are the species whose number is declined or habitat is shrunk to such an extent that they can become extinct in near future, if conservative measures are not implemented. E.g., Lion tailed monkey, Lesser florican.

Endangered species can be saved by the following ways:

- Controlling the pollution can have a positive impact on animals.
- Habitats of the species should be protected and human disturbances should be limited.
- Use of eco-friendly resources.
- Public awareness about the importance and protection of wildlife.

16. Write the effects of radioactive pollution on humans.

- Ans.**
- Radioactive pollution can occur due to two reasons as natural and artificial.
 - UV and IR radiations are natural radiations whereas X-rays and radiations from atomic energy plants are artificial radiations.
 - Chernobyl, Windscale, and Three Miles Island mishaps are the major mishaps of the world till present.
 - Thousands of people have been affected for long term due to these accidents.

Some of the effects of radiations are as follows-

- Cancerous ulceration occurs due to higher radiations of X-rays.
- Tissues in the body are destroyed.
- Genetic changes occur.
- Vision is adversely affected.

17. Name any 5 NGOs in India working on the environment.

- Ans.**
- Bombay Natural History Society, Mumbai.
 - CPR environment group, New Chennai.
 - Gandhi Peace Foundation, Environment Cell, Delhi.
 - Chipko Centre, Tehri Garhwal.
 - Centre for Environment Education, Ahmadabad.

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18. Write any 5 catchy slogans about environment protection.

Ans. Here are five catchy slogans about environmental protection:

1. "Be the change you wish to see in the world, protect the environment today!"
2. "Green is the new black: Let's make sustainability the latest trend."
3. "Reduce, reuse, recycle: The three R's for a better planet."
4. "Don't be trashy, keep it classy: Proper waste management starts with you."
5. "The earth is our home, let's keep it clean and green for generations to come."

19. How can biodiversity be conserved?

- Ans.
1. Protecting the rare species of organisms.
 2. Establishing national parks and sanctuaries.
 3. Declaring some regions as 'bioserves'.
 4. Projects for conservation of special species.
 5. Conserving all plants and animals.
 6. Observing the rules.
 7. Maintaining record of traditional knowledge.

20. Prepare a table showing the names of major wind power generation projects in India, their location and power generation capacity.

Ans.

Project Name	Location	Power Generation Capacity
Muppandal Wind Farm	Tamil Nadu	1,500 MW
Jaisalmer Wind Park	Rajasthan	1,064 MW
Vankusawade Wind Park	Maharashtra	500 MW
Dhule Wind Park	Maharashtra	150 MW
Tuticorin Wind Park	Tamil Nadu	110 MW

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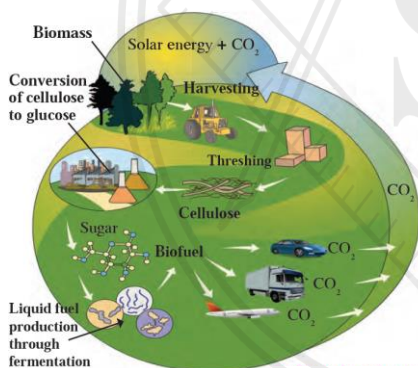
21. What products do you get from microorganisms through the fermentation process? Explain with an example.

Ans. Following are the products obtained through microbial fermentation:

- Commonly used beverages like coffee, cocoa, wine, and cider are produced by microbial fermentation of organic substrates.
- Probiotics like yoghurt, kefir, sauerkraut, miso soup, etc. are produced by microbial fermentation.
- Chemicals: Organic acids like citric acid, gluconic acid, lactic acid, itaconic acid.
- Antibiotics like niacin and natamycin; artificial sweeteners like aspartame and xylitol; etc.

22. Explain biofuel production with the help of a diagram.

Ans.

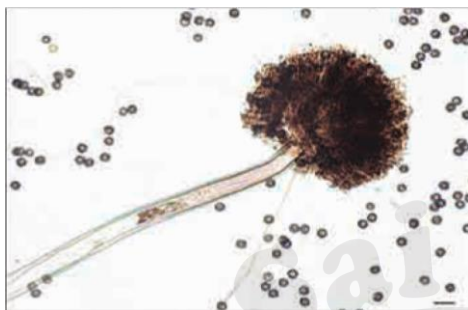


- Plants produce biomass by the process of photosynthesis in which solar energy is used to prepare carbohydrates and oxygen. Thus, biomass contains stored energy from the sun.
- Biomass includes forest residues, crop residues, etc.
- For production of biofuel, biomass is harvested and transported for threshing. The residue left after threshing contains cellulose, which is later on converted to glucose.
- The glucose is then converted to liquid fuel through fermentation, which is used for different purposes.
- Burning of biofuel releases CO_2 , which is again absorbed by plants for photosynthesis.

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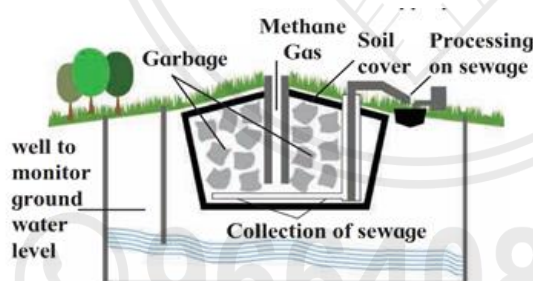
23. Observe the figure and write the answers to the questions asked.



- i. Write the name of the fungus in the figure above.
- ii. What is the source of these fungi?
- ii. Which organic acid obtained from this organism is used in commercial production?

Ans. i. The fungus represented in the given figure is *Aspergillus niger*.
ii. Sugar molasses, glucose and corn steep liquor is the source of these fungi.
iii. Organic acids like citric acid and gluconic acid are obtained from this organism and used in commercial production.

24. Observe the figure and write the answers to the questions asked.



- i. Name the above figure.
- ii. What is it used for?
- iii. Which gas is formed in it?
- iv. How is this gas formed?
- v. What is done with sewage?

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- Ans.**
- i. The given figure represents the Modern landfill site.
 - ii. It is used for disposal of degradable waste in urban areas.
 - iii. Methane gas is formed in landfill pits.
 - iv. Microbes present in the soil decompose the waste resulting in the formation of methane gas.
 - v.
 - a. In villages, domestic sewage is disposed off either in nearby soil or in biogas plant, whereas in cities, sewage is carried to processing unit and acted upon by microbial processes.
 - b. This sewage is acted upon by microbes that destroy the pathogens and decompose carbon compounds and xenobiotic compounds in the sewage.
 - c. The sludge that settles down in the process can be then used as fertilizer while the water released after microbial treatment is environmentally safe.

25. Complete the paragraph by selecting the appropriate option in parentheses.

(Energy, microbial, erosion-proof, reused, purification, environmentally Friendly)

Nowadays, instead of chemical catalysts, ... enzymes are used in the chemical industry. These enzymes are active at low temperature, pH and pressure; due to which is saved and instruments are also not necessary. Enzymes carry out specific processes; hence unnecessary byproducts are not formed due to which expenses on are minimised. In case of microbial enzymatic reactions, elimination and decomposition of waste material is avoided and enzymes can be Hence, such enzymes are

- Ans.** Nowadays, instead of chemical catalysts, microbial enzymes are used in the chemical industry. These enzymes are active at low temperature, pH and pressure; due to which energy is saved and erosion-proof instruments are also not necessary. Enzymes carry out specific processes; hence unnecessary by products are not formed due to which expenses on purification are minimised. In case of microbial enzymatic reactions elimination and decomposition of waste material is avoided and enzymes can be reused. Hence, such enzymes are environmentally friendly.

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26. Read the following paragraph and write the answers to the questions asked.

Sulphuric acid is present in the acid rain and materials coming out of mines. You know that erosion of metals present in statues, bridges and buildings occurs due to it. Sulphuric acid is a source of energy for some species of bacteria like *Acidophilum* spp. and *Acidobacillus ferrooxidans*. Hence, these bacteria can control the soil pollution occurring due to acid rain. Water soluble salts of uranium are present in the wastes produced during electroplating and in effluent released in the environment from the atomic energy plant. *Geobacter* convert these salts of uranium into insoluble salts and thereby prevent those salts from mixing with groundwater sources.

- i. What causes metal erosion in statues, bridges and buildings?
- ii. Sulphuric acid is the source of energy for which bacteria?
- iii. What kind of pollution do these bacteria control?
- iv. What are the water soluble salts in nuclear power plants and in the process of electrolysis?
- v. Which bacteria prevent these salts from mixing with ground water by converting them into insoluble salts?

- Ans.
- i. Sulphuric acid present in acid rain and materials coming out of mines causes metal erosion in statues, bridges and buildings.
 - ii. Sulphuric acid is a source of energy for some species of bacteria like *Acidophilium* spp. and *Acidobacillus ferrooxidans*.
 - iii. These bacteria control soil pollution occurring due to acid rain.
 - iv. Water soluble salts of uranium are present in the wastes produced during electroplating and in effluent released from atomic energy plant. (Note: The question has been modified as per the information given in the Textbook.)
 - v. *Geobacter* prevent these salts from mixing with ground water by converting them into insoluble salts.

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27. Write the answers to the questions by observing the figure.



- What type of fuel production process is shown in the figure?
- Write two examples each of the solid, liquid and gaseous fuels produced in this fuel production process?
- How do microorganisms play their role in this process?

Ans.

- Biofuel production process is shown in the figure.
- Solid fuels: Dung, crop residue
Liquid fuels: Vegetable oils, alcohol
Gaseous fuels: Gobar gas, coal gas
- For production of biofuel, the residue left after threshing of biomass contains cellulose, which is converted to glucose. This glucose is then converted to liquid fuel through microbial fermentation, which is used for different purposes.

28. Write down the names of five medicinal plants and their uses.

Ans. Some medicinal plants and their uses are as follows:

- Adhatoda vasica (Adulsa), a medicinal plant found in India has applications in treating respiratory disorders.
- Another important medicinal plant, Azadirachta indica (neem) is used to treat intestinal worm infections, skin conditions and various other problems.
- Medicinal plants like Ashwagandha, Tulsi, Shatavari, amla, etc. have applications as home remedies to treat various ailments and strengthen the body, or commercially for the synthesis of drugs and cosmetic products.

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29. Read the following paragraph and write the answers to the questions based on them.

Vaccination gives either permanent or temporary immunity against a specific pathogen or disease. Traditionally, vaccines were prepared with the help of pathogens. Completely or partially killed pathogens were used as vaccines. However, due to this, there were chances of contracting the disease in case of some persons. Hence, as an alternative, scientists tried to artificially produce vaccines with the help of biotechnology. For this purpose, scientists produced the antigen in the laboratory with the help of genes isolated from the pathogen and used it as a vaccine. Thus, safer vaccines are being produced. Work on production of edible vaccines is in progress and presently, potatoes are being produced with the help of biotechnology. These potatoes are called transgenic potatoes. These potatoes will act against. Consumption of these raw potatoes generates immunity against pathogens. To produce such edible vaccines, antigens are produced by isolating the desired gene from human pathogens and injecting it into plants.

- i. How can people who have been vaccinated with haemophilia be infected?
- ii. Why are vaccines produced with the help of biotechnology safer than conventional vaccines?
- iii. How does the immune system respond to vaccination?
- iv. What is the disadvantage of transgenic potatoes?
- v. Why is vaccination more beneficial than antibiotics?

Ans. i. Traditional vaccines were prepared with the help of completely or partially killed pathogens. Hence, there were chances that some who had been vaccinated would contract the disease.

[Note: This question has been modified for better understanding of the student.]

- ii. Vaccines produced by biotechnology use only antigens prepared by genes isolated from the pathogen. This eliminates the use of pathogens and reduces the chances of contracting the disease.
- iii. The immune system gets activated on encountering the pathogenic antigen, thus protecting the body from any subsequent attack by the same pathogen.

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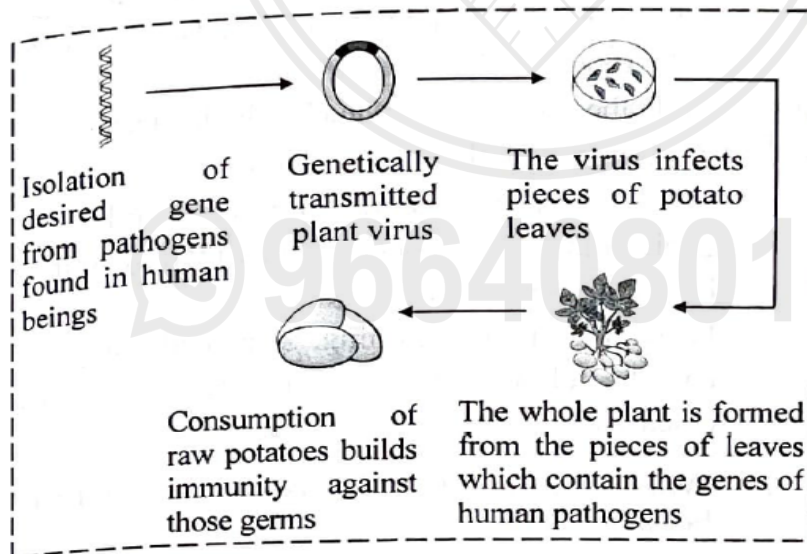
- iv. Transgenic potatoes containing edible vaccines cannot be cooked, as heating would denature the proteins and reduce the vaccine potential.
- v. Vaccines can be used to prevent a disease, whereas antibiotics are used only after a person falls ill.

30. Write the correct statement from the statements given in the box below the figure.



- a) The whole plant is formed from the pieces of leaves which contain the genes of human pathogens.
- b) Consumption of raw potatoes builds immunity against those germs.
- c) Isolation of desired genes from pathogens found in human beings.
- d) Genetically transmitted plant-virus.
- e) The virus infects pieces of potato leaves.

Ans.



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Question 4 (5 marks)

31. Explain the statement-The revolutionary phenomenon in biotechnology after cloning is stem cell research.

- Ans.**
- i. Stem cell research has the potential of bringing about fundamental changes in the medical science.
 - ii. Stem Cell therapy has the following applications:
 - a. Cell therapy: In case of medical conditions like myocardial infarction, diabetes, Alzheimer's disease, Parkinson's disease, etc., stem cells are used to replace dead cells.
 - b. In conditions like anemia, thalassemia, and leukemia, where blood count is affected, stem cells are used to produce new blood cells. This is known as regenerative cell therapy.
 - c. Organ transplantation: Advances in research may make it possible to produce organs like liver or kidney from stem cells to be used for transplantation in case of organ failure.

Hence, it is rightly said that the revolutionary phenomenon in biotechnology after cloning is stem cell research.

32. How can we solve many environmental problems using modern biotechnology?

Ans. Many environmental problems are solved using modern biotechnology. Some of these are as follows:

- i. Microbial techniques are commonly used for treatment on sewage and solid waste.
- ii. Sewage (rich in organic matter) should be released in rivers only after oxidation with the help of microbial technique.
- iii. Microbes are useful on large scale for production of compost by decomposing solid organic waste material.
- iv. Bioremediation, biopesticides, biofertilizers, biosensors, etc, are some new concepts in biotechnological methods which can effectively be used to protect the environment.

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- v. 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 'Phyto-remediation'.

e.g.

- Pseudomonas 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.
- Deinococcus radiodurans has been genetically modified and used to absorb the radiations from radioactive debris.
- Grasses like alfalfa, clover and rye are used in Phyto-remediation.

['Note: Students are expected to write required number of points based on the marks allotted to the question.']

33. How is biotechnology useful for human health? Explain with an example.

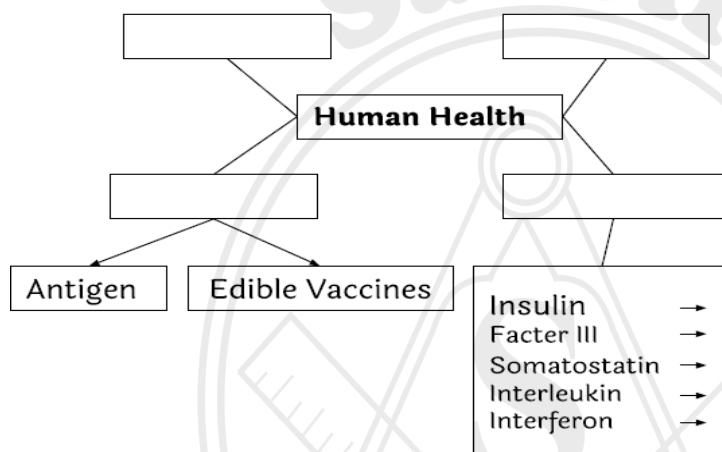
- Ans.**
- Diagnosis and treatment of diseases are the two important aspects of human health management where biotechnology plays an important role.
 - Diagnosis: Biotechnology helps to identify the role of gene in disease of a person. Diagnosis of diabetes and heart diseases has become possible even before the onset of symptoms, with the help of biotechnology. Diagnosis of the diseases like AIDS, dengue can be done within few minutes.
 - Therapy: Biotechnology is useful for production of hormones like insulin, somatotropin, and blood clotting factors.
 - Vaccines and vaccination: Biotechnology has led to the development of safer vaccines which make use of only antigens rather than the complete pathogen. Edible vaccines are also being developed with the help of biotechnology.
 - Interferons: Biotechnology is used to produce interferons from transgenic *E. coli*, that are useful for treatment of viral diseases.

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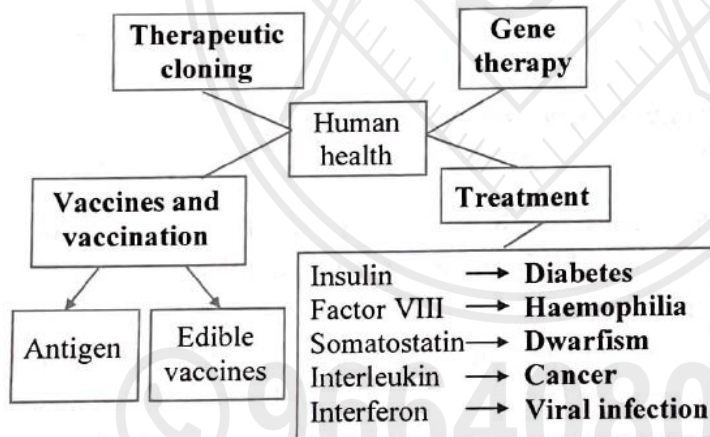
Question 4 (5 marks)

- vi. Gene therapy: Gene therapy to treat genetic disorders in somatic cells has become possible due to biotechnology.
- vii. Therapeutic Cloning: Stem cells can be derived from the cell formed in laboratory by the union of somatic cell nucleus with the enucleated egg cell. Various diseases can be treated with the help of these stem cells.

34. Complete the concept paper based on 'Use of Biotechnology in Human Health'.



Ans.



35. Write the answers to the following questions regarding cloning.

- What is cloning?
- What is reproductive cloning?
- What is therapeutic cloning?
- Which animal was created by cloning technique?
- Explain the advantages of cloning technique.

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Question 4 (5 marks)

- Ans.**
- Cloning is the process of production of replica of any cell or organ or an entire organism.
 - Fusion of a nucleus of somatic cell with the enucleated ovum to form a complete new organism is known as reproductive cloning.
 - Somatic cells are fused with an enucleated egg cell, to obtain stem cells. This is known as therapeutic cloning.
 - Dolly the sheep was created by cloning technique.
 - Advantages of cloning technique are as follows: Genes can also be cloned to produce millions of copies that can be used for gene therapy to treat hereditary diseases.

36. What does the next picture show? What will be the effect?



- Ans.**
- The picture shows a man taking selfies on the road also known as SELFIECIDE.
 - Effect: Taking selfies on road may lead to severe injuries or death, as the person becomes so engrossed in clicking selfie that he is not aware about the world around him.

37. What does the next picture mean?



- Ans.** This picture indicates that we should stay away from addictive substances like alcohol, tobacco, cigarette, gutkha, drugs.

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Question 4 (5 marks)

38. Observe the figure and write the answers to the questions asked.



- i. What does this picture show?
- ii. Explain any two reasons for this problem.
- iii. Name any two solutions to solve this problem.

Ans. i. The picture shows a person becoming victim to mental stress.

ii. Some of the reasons for the increase in mental stress are as follows:

- a. Increased competition in opportunities for education, employment, and business.
- b. Loneliness and mental stress in children due to reasons like nuclear family and parents staying outdoors for work.
- c. Increased social disorder, crime, and violence.
- d. Persons turning to crime and violence as easy means of earning money and finally becoming a victim of the same system.
- e. Stress in girls due to excessive bindings on them at home as compared to boys.
- f. Stress in adolescent girls due to social evils like teasing and molestation as well as gender inequality.

[Any two reasons]

iii. Some of the ways to reduce mental stress are as follows:

- a. Maintaining good communication and expressing our feelings to friends, peers, cousins, teachers, and parents or noting them down in a diary.
- b. Utilizing the free hours in fostering hobbies like material collection, photography, reading, cooking, sculpting, drawing, making rangoli, dancing, singing, listening to music, etc.

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- c. Diverting energy and mind towards positive thinking, so as to neutralize the negative thoughts. Regular exercising, getting a massage, practicing yoga and meditation.
 - d. Laughing loudly to relieve stress.
 - e. Playing sports and outdoor games to involve physical exercise, inculcate discipline, increase interaction with others, drive away loneliness, etc.
 - f. Inculcating traits like time management, planning of our own duties, and taking own decisions.
 - g. If any of the above methods fail to reduce stress and leads to more serious problems like depression and frustration, then medical help, counselling and/or psychotherapy should be taken.
- [Any two solutions]*

39. Write answers to the questions based on the paragraph.

Social health is the ability of a person to establish relationships with other persons. Ability to change one's own behaviour according to changing social conditions is an important characteristic of social health. A socially healthy person can also cope with a variety of social situations. Can behave appropriately and adaptable to changing circumstances. Your spouse can match such people with your co-workers and form good relationships. All of these relationships require good communication. It is important to have empathy and a sense of responsibility for each other. On the other hand, there are negative shades like jealousy, revenge, and loneliness. If there is tension in the relationship, healthy relationships will not be formed. Stress management, planning appropriate measures e.g. Regular exercise, deep breathing, and a positive attitude can improve social health.

- i. What is social health?
- ii. What qualities are needed to build good social relationships?
- iii. Which vices have negative consequences?
- iv. What measures would you take for stress management?
- v. Give two examples of negative shades.

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Question 4 (5 marks)

- Ans.**
- i. Social health is the ability of a person to establish relationships with other persons.
 - ii. The following qualities are needed to build good social relationships:
 - a. Ability to change one's own behaviour according to changing social conditions is an important characteristic of social health.
 - b. A socially healthy person can also cope with a variety of social situations.
 - c. They can behave appropriately and be adaptable to changing circumstances.
 - d. Good communication with others.
 - iii. Vices like jealousy, revenge and loneliness have negative consequences.
 - iv. Regular exercise, deep breathing, and a positive attitude are measures to take for stress management.
 - v. Jealousy, revenge, and loneliness. *[Any two examples]*

40. What factors determine social health?

- Ans.** The factors that determine or affect social health are as follows;
- i. The ability of a person to establish relationship with other persons in the society is known as social health.
 - ii. The main factors which disturb the social health of an individual are:
 - a. Mental stress
 - b. Addiction
 - c. Incurable diseases
 - d. Excessive use of modern technology
 - iii. Apart from these the other factors which affect the social health are:
 - a. Education and financial status of people.
 - b. Number of gardens and playgrounds in the vicinity.
 - c. Social and physical conditions of the surroundings.
 - d. The type of residential area.
 - e. Provision of water and availability of toilets
 - f. Political conditions (views)
 - g. Social treatment of people

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Question 4 (5 marks)

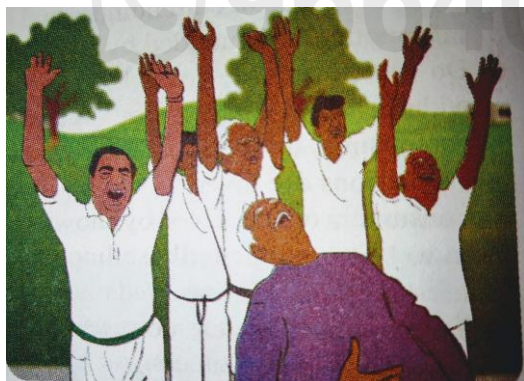
- h. Social safety
- i. Transport facilities
- j. Education and job opportunities
- k. Fulfilment of basic needs of people including food, clothing, shelter and medicines.

41. What are the changes in a person due to constant contact with the internet, mobile, phone?

Ans. Some of the effects of excessive and irrational use of internet and mobile phones include the following:

- i. Person using mobile phone for a long time remains unaware of his or her surroundings.
- ii. The radiation of mobile phones causes several problems like tiredness, headache, insomnia, forgetfulness, tinnitus (buzzing in the ears), joint pains as well as problems in vision. The radiations affect children more than adults.
- iv. Also, continuous use of computers and internet makes a person solitary and incapable to establish harmonious relations with relatives and other members of the society.
- v. Such habits further make a person self-centered in nature and thereby lead to problems like selfishness.

42. Write the answers to the questions by observing the picture.



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Question 4 (5 marks)

-
- i. What is the concept shown in the picture?
 - ii. Write its benefits.
 - iii. What do you do when you feel stressed?

- Ans.**
- i. The concept of laughter clubs in which people relieve mental stress by laughing loudly, is shown in the picture.
 - ii. The benefits of laughter clubs are to relieve mental stress and improve social health.
 - iii. To relieve stress, I foster hobbies like material collection, photography, reading, cooking, sculpting, drawing, making rangoli, dancing, singing, listening to music, etc.



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