CBSE Class 12 Biology

Sample Paper 07 (2020-21)

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

i. All questions are compulsory.
ii. The question paper has four sections: Section A, Section B, Section C and Section D. There are 33 questions in the question paper.
iii. Section–A has 14 questions of 1 mark each and 02 case-based questions. Section–B has 9 questions of 2 marks each. Section–C has 5 questions of 3 marks each and Section–D has 3 questions of 5 marks each.
iv. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
v. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. Give the function of sertoli cells.
2. Name any one symbiont, which serves as biofertiliser. Mention it's specific role.
3. Write the possible genotypes Mendel got when he crossed F_1 tall pea plants with a dwarf pea plants.
4. List various natural methods of birth control.
5. In which direction is the new strand of DNA synthesized during DNA replication.
6. A garden pea plant (A) produced inflated yellow pod, and another plant (B) of the same Produced constricted green pods. Identify the dominant traits.
7. When does a geneticist need to carry a test cross?
8. What happens in lymphoid organs with respect to immunity?
9. What kind of changes has been observed in day and night length when one moves from the equator to the polar regions?
10. Which group of bacteria found in both the rumen of cattle and sludge of sewage

treatment?

11. **Assertion:** An organism with a lethal mutation may not even develop beyond the zygote stage.

    Reason: All types of gene mutations are lethal.

    a. The assertion is a true statement but the reason is false.
    b. Both assertion and reason are true and the reason is the correct explanation of the assertion.
    c. Both assertion and reason are true but the reason is not the correct explanation of the assertion.
    d. Both assertion and reason are false.

OR

Assertion: The cross between red and white flower bearing snapdragon plants results in a pink coloured flower.

Reason: Incomplete dominance of red and white flower results into pink coloured flower.

a. Both assertion and reason are correct.
b. The assertion is correct but the reason is incorrect
c. The assertion is incorrect but the reason is correct.
d. Both assertion and reason are incorrect.

12. **Assertion:** The dope test is used to estimate the level of blood alcohol by analyzing the breath of persons drinking alcohol.

    Reason: A drunken person usually feels tense and less talkative.

    a. Both Assertion and Reason are false
    b. Both Assertion and Reason are true and the Reason is the correct explanation of the Assertion
    c. Both Assertion and Reason are true and the Reason is not the correct explanation of the Assertion
    d. The assertion is a true statement but the reason is false

13. **Assertion:** Breastfeeding during the initial period of lactation is recommended by doctors for bringing up a healthy baby.

    Reason: The initial period of lactation contain colostrum that contains several antibodies.

    a. Both assertion and reason are correct

b. The assertion is correct but the reason is incorrect
c. Both assertion and reason are incorrect
d. Reason does not explain the assertion

14. **Assertion:** For toxicity testing, transgenic animals are made to carry genes that make them more sensitive to a toxic substance.
Reason: Transgenic animals are exposed to toxic substances to be studied to know their effect.
a. Both assertion and statements are correct
b. Assertion is correct but reason is incorrect
c. Both assertion and reason are incorrect
d. Assertion is incorrect but reason is correct

15. **Read the following and answer any four questions:**
The primary sex organs are testis in the males and the ovaries in the females produce gametes, i.e, sperms, and ovum, respectively by the process called gametogenesis. In testis, the immature male germ cells (spermatogonia) produce sperms by spermatogenesis that begins at puberty. Each spermatogonium is diploid and contains 46 chromosomes. A primary spermatocyte completes the first meiotic division (reduction division) leading to the formation of two equal, haploid cells that have only 23 chromosomes each. The secondary spermatocytes undergo the second meiotic division to produce four equal, haploid spermatids.
i. In humans, at the end of the first meiotic division, the male germ cells differentiate into the
a. spermatids
b. spermatogonia
c. primary spermatocytes
d. secondary spermatocytes
ii. How many sperms are formed from 4 primary spermatocytes?
a. 4
b. 1
c. 16
d. 32
iii. In spermatogenesis, reduction division of chromosome occurs during conversion of
a. spermatogonia to primary spermatocytes

b. primary spermatocytes to secondary spermatocytes
c. secondary spermatocytes to spermatids
d. spermatids to sperms.

iv. After spermiogenesis, sperm heads become embedded in the
a. Sertoli cell
b. Germ cell
c. Leydig cell
d. None of these

v. **Assertion-** Spermatogenesis starts at the age of puberty due to the increase in the secretion of gonadotropin-releasing hormone
Reason- LH acts at the Leydig cells and stimulates synthesis and secretion of androgens
a. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion
b. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion
c. The Assertion is true but the Reason is false
d. Both the statements are false

16. **Read the following and answer any four questions:**
We use microbes or products which are derived from them every day. A common example is the production of curd from milk. Micro-organisms such as Lactobacillus and others commonly called lactic acid bacteria (LAB) grow in milk and convert it to curd. The dough, which is used for making foods such as dosa and idli is also fermented by bacteria. A number of traditional drinks and foods are also made by fermentation by the microbes. 'Toddy', a traditional drink of some parts of southern India is made by fermenting sap from palms. The 'Roquefort cheese' is ripened by growing specific fungi on them, which gives them a particular flavour. Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes used.

i. Which of the following organisms is used in the production of beverages?
a. Penicillium notatum
b. Saccharomyces cerevisiae
c. Aspergillus niger

d. Clostridium butylicum

ii. Microbes are present in
   a. soil
   b. thermal vents
   c. polluted water
   d. all of these

iii. Saccharomyces cerevisiae is used primarily for
   a. Baking
   b. Bleaching
   c. Biofuel
   d. None of the above

iv. The large holes in 'Swiss cheese' are due to
   a. production of a large amount of CO_2
   b. production of O_2
   c. due to the presence of water
   d. none of these

v. **Assertion-** Lactic acid bacteria (LAB) grow in milk and convert it to curd.
   Reason- It produces acids that coagulate and partially digest the milk proteins.
   a. Both Assertion and Reason are true and Reason is the correct explanation of the Assertion
   b. Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion
   c. Our Assertion is true but the Reason is false
   d. Both the statements are false

Section B

17. Briefly explain two natural barriers for birth control.
18. Identify the sex of organism as male or female in which the sex chromosome are found as
   i. ZW in bird
   ii. XY in Drosophila
   iii. ZZ in birds
   iv. XO in grasshopper.
19. Why is proinsulin so-called? How is insulin different from it?
20. Name the first transgenic cow. Which gene was introduced in this cow?

OR

What are second generation vaccines?

21. Read carefully the sequence of codons in the mRNA unit and answer the question:

a. What change is needed in the first codon to start the translation process?

b. If translation starts by that change, till which codon it can continuous? Why?

22. What are the areas which have been responsible for the recent advances in biotechnology?

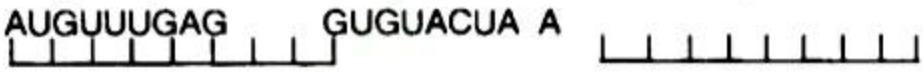
OR

Do eukaryotic cells have restriction endonucleases?

23. Where are the endemic species concentrated in India?
24. Differentiate between climate and weather.
25. Mention the kind of biodiversity of more than a 1000 varieties of mangoes in India represent. How is it possible?

Section C

26. Why Mendel's work remain unnoticed and unappreciated for about 35 years?
27. Study the given m-RNA segment and answer the questions that follow:



i. Redraw the m-RNA segment indicating:
   a. 5' and 3' ends
   b. the initiating and stop codons

ii. Draw a schematic diagram of t-RNA showing the following:
   a. methionine attached to the amino acid acceptor site
   b. the correct base sequence at the anticodon loop

iii. What role do 'untranslated regions' on m-RNA segment play in protein synthesis?

28. How does a vaccine for a particular disease immunise the human body against that disease?
29. Explain the process of translation.
30. Fill in the blanks a, b, c and d in the different columns of the table given below:

	Causal		

Disease	organism	Medium of Transfer	Symptoms
Filariasis	Wuchereria	a	Lymphatic vessels of lower limbs affected
b	Trichophyton	Using towels of infected person	Dry, scaly lesions on body
Common cold	c	Droplets from Sneezing of infected persons	Affect nose, and respiratory passage, sore throat
Ascariasis	Ascaris	Through contaminted water, vegetables and fruits	d

OR

How is innate immunity different from the immunity that you require through vaccines? Describe any two ways by which innate immunity can be accomplished?

Section D

31. Angiospermic flowers may be monoecious, cleistogamous or show self-incompatibility. Describe the characteristic features of each one of them and state which one of these flowers promotes inbreeding and outbreeding, respectively?

OR

Draw the detailed structure of a maize grain and explain its internal structure.

32. What are bioreactors? Draw labelled diagrams of the two types of bioreactors. What is their utility? Which is the common type of bioreactors?

OR

How is the desired DNA for biotechnology experiments first fragmented and later separated by gel-electrophoresis? Explain.

33. List the different ways by which organisms cope or manage with abiotic stresses in nature. Explain any three ways.

OR

How do stenothermal organisms differ from eurythermal organisms?

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Solution

Section A

1. These nurse cells provide nourishment and shape to developing spermatozoa. They also secrete an androgen-binding protein (which concentrates testosterone).
2. Rhizobium is a symbiotic bacteria that serves as biofertiliser.
   The bacteria fix the atmospheric nitrogen into organic forms, which is used by the plants as nutrients.
3. Tt and tt
4. Periodic abstinence, coitus interruptus and lactational amenorrhea are some natural methods of birth control.
5. New strand of DNA is synthesized in $5' \rightarrow 3'$ direction.
6. The inflated-pod trait is dominant over constricted pod while yellow pod colour is recessive to green-pod (dominant) in pea plant.
7. A geneticist needs to carry a test cross when he wants to determine the genotype of an organism, with a dominant phenotype trait, whether it is homozygous or heterozygous.
8. The maturation and proliferation of lymphocytes.
9. As one moves from the equator to the polar regions, the length of the day decreases and the length of the night increases.
10. Methanogen group of bacteria found in both the rumen of cattle and sludge of sewage treatment.
11. (a) The assertion is a true statement but the reason is false.
    Explanation: An organism with the lethal mutation may not even develop beyond the zygote stage due to change in the gene but all kinds of mutations are not lethal. The mutation is the main source of variation essential for evolution.

OR

(a) Both assertion and reason are correct.

Explanation: In Snapdragon flower, a cross between true-breeding white and red coloured flower produces a pink coloured flower in F1generation. This happens due to

incomplete dominance of alleles over the other.

12. (a) Both Assertion and Reason are false

    Explanation: The dope test is done to estimate the level of blood alcohol by analyzing the blood and urine samples. A drunken person is not able to take correct decisions due to improper coordination of the nervous system and feels free from all worries.

13. (a) Both assertion and reason are correct

    Explanation: Breastfeeding during the initial few days of lactation is recommended by doctors because it contains immunoglobin containing colostrum that provides antibodies to fight infection.

14. (a) Both assertion and statements are correct

    Explanation: Transgenic animals are used to study the toxicity effects of a certain chemical in which animals are made to carry a gene which makes them more sensitive to a toxic substance and exposed to a toxic substance to be studied.

15. i. (d) Secondary spermatocytes
    ii. (c) 16
    iii. (b) primary spermatocytes to secondary spermatocytes
    iv. (a) Sertoli cell
    v. (b) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion

16. i. (b) Saccharomyces cerevisiae
    ii. (d) all of these
    iii. (a) Baking
    iv. (a) production of a large amount of CO_2
    v. (a) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion

Section B

17. i. **Periodic abstinence** - The couple should avoid coitus from the 10th to the 17th day of the menstrual cycle.
    ii. **Coitus interruptus** - The male partner withdraws his penis from the vagina just before ejaculation of semen.

18. i. Female
    ii. Male
    iii. Female

iv. Male

19. i. In mammals, including humans insulin is synthesised as proinsulin, an inactive prohormone (needs to be processed before it becomes a fully mature and functional hormone) which contains an extra-stretch called C-peptide.
    ii. The C-peptide is not present in the mature insulin and is removed during maturation of proinsulin.
20. Rosie was the first transgenic cow and it was produced in 1997. The gene for human protein alpha-lactalbumin was introduced in this cow. Thus, the cow could produce protein-enriched milk. This milk was nutritionally more balanced than natural cow milk.

OR

With the help of genetic engineering, vaccines of immense importance are synthesized, called second-generation vaccines. They consist of a few antigens present on the surface of the infecting agents rather than the whole inactivated organism (first generation vaccine). The surface antigens are produced in large quantities with the help of recombinant DNA technique. These vaccines are injected in safer, doses to healthy individuals for the development of immunity. They are more uniform in quality and have less side effects than first-generation vaccines. For example, a vaccine for Hepatitis-B.

21. a. Start Codon- AUG. So Insertion mutation can take place and changes A to G.
    b. The translation continues till UGA because it is a stop codon.
22. Biotechnology is an area of production and research in which biological systems and biological principles are employed to solve technological problems. In this sense it becomes all inclusive.
    The areas in recent advances in biotechnology are (I) Agriculture (ii) Medicine (iii) Food industry and (iv) Environmental engineering.

OR

No, eukaryotic cells do not have restriction endonucleases. This is because the DNA of eukaryotes is highly methylated by a modification enzyme, called methylase. Methylation protects the DNA from the activity of restriction enzymes. These enzymes are present in prokaryotic cells where they help prevent the invasion of DNA by virus.

23. Endemic species are found concentrated in North East, North West, Western Ghats and Andaman Nicobar Islands. Lion-Tailed Macaque in Western Ghats and Andaman serpent-

eagle found in Andaman Nicobar Islands are examples of some endemic species.

24.

Habitat	**Weather**
1. Average weather of an area is called climate.	1. The short term properties of the atmosphere at a given place and time are termed.
2. It entails changes of long term.	2. It reflects hourly, daily or weekly changes.

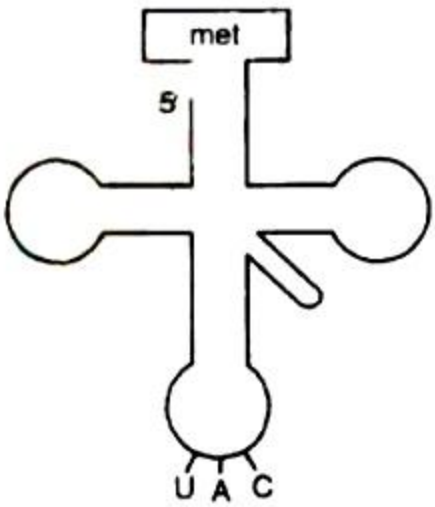
25. The different varieties of mangoes in India represent genetic diversity.
It occurs because India lies within tropical latitudes where, the environment is constant and predictable. Also, more solar energy is available which leads to higher productivity.

Section C

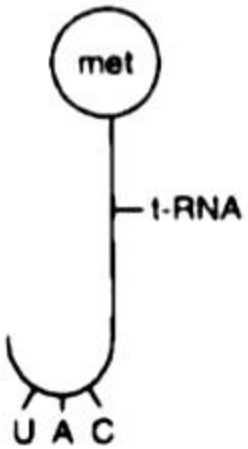
26. Mendel's work remained unnoticed for about 34 years due to:
    i. Limited circulation of the "Proceedings of Brunn Natural Science Society" in which it was published.
    ii. Mendel's conclusions about heredity were ahead of his time.
    iii. He could not convince himself about his conclusions being universal.
    iv. Lack of aggressiveness in his personality.
    v. The scientific world was being rocked at that time by Darwin's theory of evolution (Origin of Species, 1859).

27. i. 

    a. Initiating codon: A U G
    b. Stop codon: U A A

ii. a. 

b.



iii. m-RNA has methylated region at the 5' terminus. It functions as a cap for attachment with the ribosome. The cap has nucleotides complementary to the nucleotides present at 3' end of r-RNA.

28. During vaccination for a particular disease, an antigen or antigenic protein or pathogen which is in inactive form is introduced into the body to induce a mild immune response. The vaccine generates antibodies that neutralise the toxin/pathogen and produces memory B or T-cells, which recognise the pathogen in the subsequent encounters and produce antibodies.
29. Translation is the process of polymerisation of amino acids to form a polypeptide.
    The different phases of translation are:
    i. **Activation of amino acids:** It occurs in the presence of ATP and link to their cognate tRNA, in the presence of aminoacyl tRNA synthetase enzyme.
    ii. **Initiation of polypeptide synthesis:** It occurs in ribosomes which is known as the cellular factory for protein synthesis.
    iii. **Elongation of polypeptide chain:** It occurs when a second tRNA charged with an appropriate amino acid binds to the A-site of the ribosome.
    iv. **Termination of polypeptide:** It occurs when a release factor binds to the stop codon.
30. (a) Female mosquito (Culex)
    (b) Ringworm
    (c) Rhinovirus
    (d) (i) Blockage of intestinal passage (ii) Anaemia

OR

Differences between innate immunity and acquired immunity are:

Innate immunity	Acquired immunity

It is non-specific.	It is pathogen specific
It is present from birth and inherited from parents	It develops after birth and through vaccination
It does not cause side effects	It may cause certain reactions against vaccination

Innate immunity can be accomplished by:

i. Physiological barriers like tears in eyes, acid in stomach, saliva in mouth, etc.
ii. Cytokinin barriers, i.e interferons produced by virus-infected cells to protect non-infected cells from viral infection.

Section D

31. The characteristic features of angiospermic flowers
    i. Monoecious flowers are unisexual, i.e. they have either the male reproductive or female reproductive part in separate flowers, both
    produced on the same plant The flowers (male and female) are separate It prevents self- pollination and promotes cross-pollination.
    ii. Cleistogamous flowers are those flowers in which anthers and stigmas lie close to each other and do not open at all, even at maturity. These flowers are invariably autogamous and promote inbreeding depression as there is no chance for cross-pollination at all.
    iii. Self-incompatible in angiospermic flowers is a genetic mechanism, wherein the flowers prevent the self-pollens from fertilising the ovules or inhibit their germination on stigma. This device or mechanism promotes outbreeding.

OR

Structure of maize grain: Maize grain is a single-seeded fruit having inseparable pericarp (fruit wall) fused with the testa (seed coat) and is called caryopsis or grain. The internal structure can be studied by cutting a longitudinal section of the soaked grain at right angles to the two flat surfaces. On the outside, there is a single hard covering representing the fused pericarp and testa. Inner to this, the grain is divided into two unequal portions namely endosperm and the embryo. The endosperm is larger and lies towards the broader side. It is yellowish or whitish and stores starch as reserve food. The outermost layer of the endosperm contains proteins and form a specialized sheath called

the aleurone layer. The lateral embryo consists of a single shield-shaped cotyledon called scutellum. This cotyledon has a thin, secretory epithelial layer, just in contact with the endosperm. The region of the embryo axis that points downward from the point of attachment of the cotyledon is the radicle. It is covered by a protective sheath called coleorhiza. The region of embryonal axis above the point of attachment of the cotyledon is known as plumule. It is surrounded by a protective tubular sheath called the coleoptile. Maize grain is monocot endospermic.

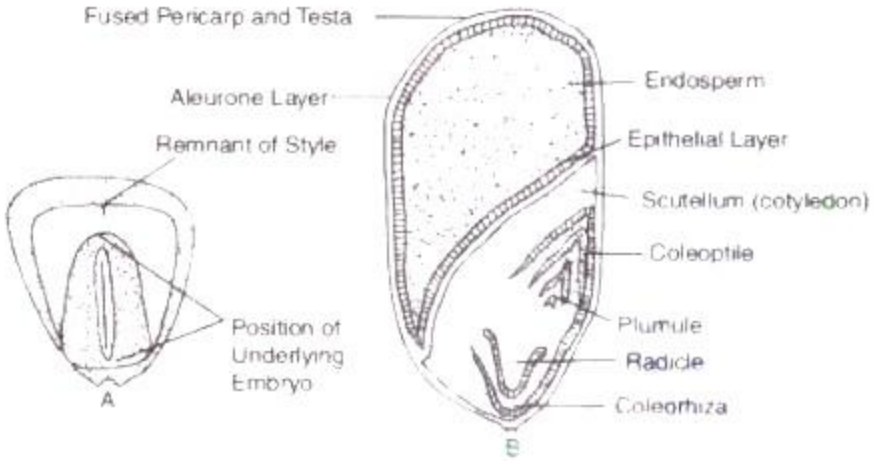
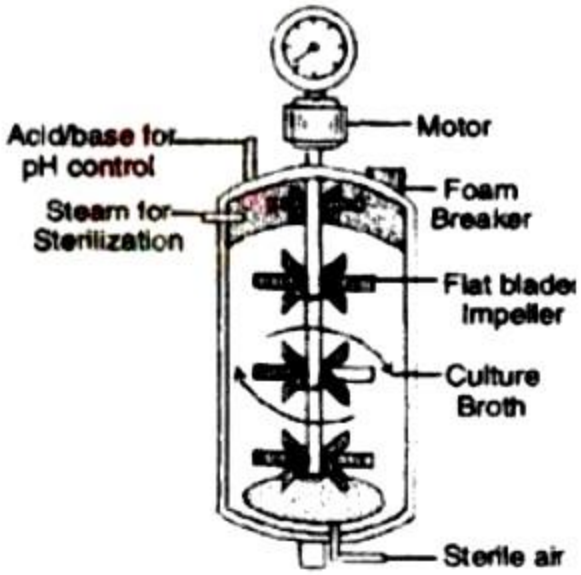
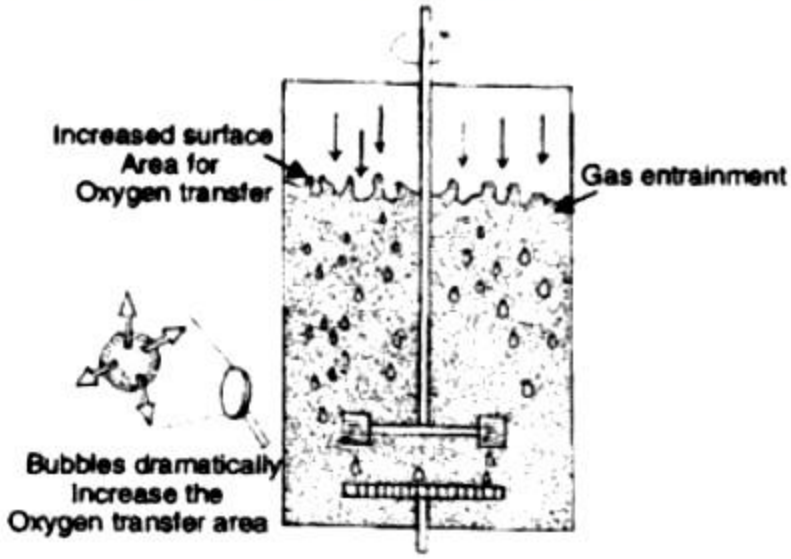


Fig: Structure of maize grain

32. The bioreactors are large vessels in which raw materials in large volumes (100-1000 litres) are biologically converted into large quantities of specific products, using microbial, plant, animal or human cells or individual enzymes. A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions(temperature, pH, substrate, salts, vitamins, oxygen).
    i. Sample stirred-tank bioreactor



ii. Sparged stirred-tank bioreactor through which sterile air bubbles are sparged.

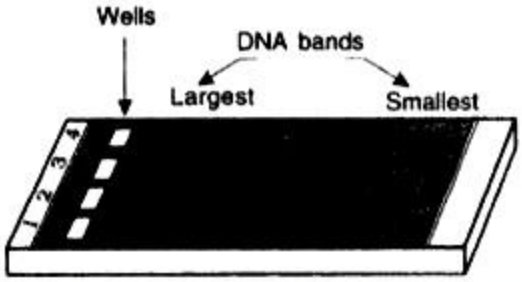


One of the most commonly used bioreactors is of stirring type.
A stirred tank reactor is usually cylindrical or with a curved base to facilitate the mixing of the reactor contents. The stirrer facilitates even mixing and oxygen availability throughout the bioreactor. Alternatively, air can be bubbled through the reactor. The bioreactor has an agitator system, an oxygen delivery system, a foam control system, a temperature control system, pH control system, sampling ports so that small volumes of the culture can be withdrawn periodically.

OR

i. Cutting DNA at specific location:-
   a. Fragmentation of DNA is carried out by incubating purified DNA molecules with restriction enzyme at optimal conditions of temperature and pH for that specific enzyme.
   b. Agarose gel electrophoresis technique is employed to check the progression of restriction enzyme digestion.
   c. The similar process is repeated with vector DNA.

ii. Separation and isolation of DNA fragment:- It is carried out by technique gel-electrophoresis.
   a. DNA fragments being negatively charged, can be separated by forcing them to move towards anode under an electric field through a medium/matrix (agarose). DNA fragments separate (resolve) according to their size through sieving effect provided by the agarose gel. The smaller the fragment size, the farther it moves.



b. DNA fragments can be visualised by staining DNA with ethidium bromide followed by exposure to UV radiations. Bright orange colour bands of DNA become prominent in the gel. The separated bands of DNA are cut out from the gel and extracted from the gel piece. This step is known as elution.

c. Purified DNA fragments are used for reconstructing recombinant DNA by joining them with cloning vectors.

33. Organisms cope up with abiotic stress by

i. **Regulatory mechanism:** Some organisms maintain homeostasis by physiological and behavioural means They are called regulators, e.g.

a. In summers, when the outside temperature is more, we sweat profusely that results in evaporative cooling to bring down the body temperature

b. In winters, when the temperature is low, we shiver (a kind of exercise) that produces heat and raise the body temperature.

ii. **Conformer mechanism:** Organisms that cannot maintain a constant internal environment and their body temperature changes with the ambient temperature are called conformers For example, small animals have a larger surface area relative to their volume. They lose body heat very fast at low temperature So, they expend energy to generate body heat through metabolism for adjusting.

iii. **Migrating:** The temporary movement of organisms from the stressful habitat to a more hospitable area and return when favourable conditions reappear is called migration. The long-distance migration is very common in birds.

OR

Eurythermal	Stenothermal
Eurythermal animals are animals that can tolerate a wide range of temperatures.	Stenothermal animals are the animals that can tolerate a narrow range of temperature or only certain temperatures.

Eurythermal animals show reduced temperature sensitivity.	Stenothermal animals show high-temperature sensitivity.
Eurythermal animals are functioning at a wide range of body temperatures.	Stenothermal animals are not functioning at a wide range of body temperatures.
Eurythermal animals are only one type.	Stenothermal animals are two main types namely thermophilic and cryophilic.
Eurythermal animals are not affected by temperature.	Stenothermal animals are greatly affected by temperature.
Eurythermal animals include goat, man, cat, dog, tiger, cow, sheep, monkey, green crab, etc.	Stenothermal animals include reptiles, crustaceans, insects, salmon, penguin, python, crocodile, etc.