

Sample Paper-3 (2023-24)

Class: XII Biology
(Subject Code-044)

Maximum Marks: 70

Time: 3 hours

General Instructions:

- i) All questions are compulsory.
- ii) The question paper has three sections and 33 questions. All questions are compulsory.
- iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; and Section–C has 7 questions of 3 marks each; section-D has 2 case-based question of 4 marks each and section-E 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. The spermatogonia undergo division to produce sperms by the process of spermatogenesis. Choose the correct one with reference to the above.

- a. Spermatogonia have 46 chromosomes and always undergo meiotic cell division
- b. Primary spermatocytes divide by mitotic cell division
- c. Secondary spermatocytes have 23 chromosomes and undergo second meiotic division
- d. Spermatozoa are transformed into spermatids

Ans. c. Secondary spermatocytes have 23 chromosomes and undergo second meiotic division

2. Intensely lactating mothers do not generally conceive due to the:

- a. Suppression of gonadotropins
- b. Hypersecretion of gonadotropins
- c. Suppression of gametic transport
- d. Suppression of fertilization

Ans. a. Suppression of gonadotropins

3. Emergency contraceptives are effective if used within:

- a. 72 hrs of coitus
- b. 72 hrs of ovulation
- c. 72 hrs of menstruation
- d. 72 hrs of implantation

Ans. a. 72 hrs of coitus

4. Which of the following will not result in variations among siblings?

- a. Independent assortment of genes
- b. Crossing over
- c. Linkage
- d. Mutation

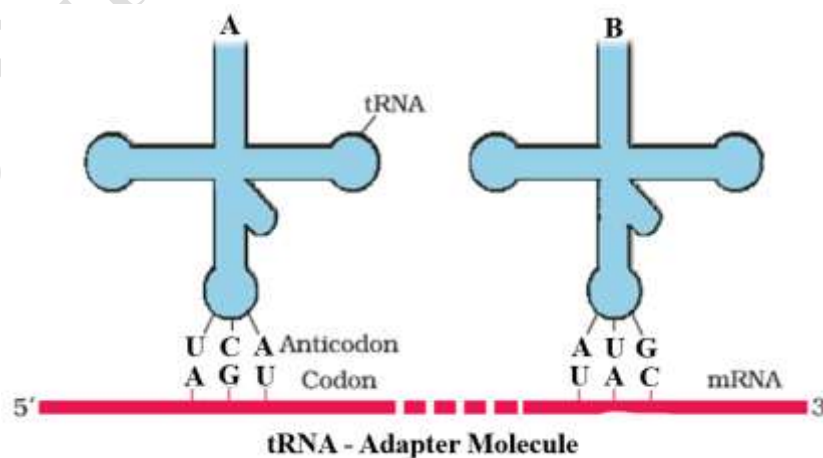
Ans: c. Linkage

5. Mother and father of a person with 'O' blood group have 'A' and 'B' blood group, respectively. What would be the genotype of both mother and father?

- a. Mother is homozygous for 'A' blood group and father is heterozygous for 'B'
- b. Mother is heterozygous for 'A' blood group and father is homozygous for 'B'
- c. Both mother and father are heterozygous for 'A' and 'B' blood group, respectively
- d. Both mother and father are homozygous for 'A' and 'B' blood group, respectively

Ans: c. Both mother and father are heterozygous for 'A' and 'B' blood group, respectively

6. The tRNAs shown below transfer the following aminoacids during translation.



- a. Alanine and Threonine
- b. Alanine and Valine
- c. Serine and Tyrosine
- d. Serine and Threonine

Ans. c. Serine and Tyrosine

7. The human chromosome with the highest and least number of genes in them are respectively:

- a. Chromosome 21 and Y
- b. Chromosome 1 and X
- c. Chromosome 1 and Y
- d. Chromosome X and Y

Ans c. Chromosome 1 and Y

8. Which type of selection explains industrial melanism observed in the moth, Boston Bulgaria:

- a. Stabilising
- b. Directional
- c. Disruptive
- d. Artificial

Ans: b. Directional

9. Which of the following enzymes catalyse the removal of nucleotides from the ends of DNA?

- a. endonuclease
- b. exonuclease
- c. DNA ligase
- d. Hind – II

Ans: b. exonuclease

10. A protoxin is:

- a. A primitive toxin
- b. A denatured toxin
- c. The toxin produced by protozoa
- d. Inactive toxin

Ans. d. Inactive toxin

11. What will happen to a well-growing herbaceous plant in the forest if it is transplanted outside the forest in a park?

- a. It will grow normally
- b. It will grow well because it is planted in the same locality
- c. It may not survive because of a change in its micro-climate
- d. It grows very well because the plant gets more sunlight

Ans. c. It may not survive because of a change in its micro-climate

12. Amensalism is an association between two species where:

- a. one species is harmed and other is benefitted
- b. one species is harmed and other is unaffected
- c. one species is benefitted and other is unaffected
- d. both the species are harmed.

Ans. b. one species is harmed and other is unaffected

Question No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

- (a) Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (b) Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (c) Assertion is true but Reason is false.
- (d) Both Assertion and Reason are false.

13. Assertion: An ecosystem consists of biotic components and abiotic components.

Reason: Biotic and abiotic components play important roles for the sustenance of life and work independently in all ecosystems.

Ans. (a) Assertion and Reason are true and Reason is the correct explanation of Assertion.

14. Assertion: Warm and moist environments can enhance the rate of decomposition.

Reason: Warm and moist climate leads to an anaerobic condition which promotes decomposition.

Ans. (b) Assertion and Reason are true but Reason is not the correct explanation of Assertion.

15. Assertion: Speciation is a function of time and tropical regions had got a long evolutionary time for species diversification as compared to temperate regions.

Reason: Temperate regions have undergone frequent glaciations in the past whereas tropical regions have remained relatively undisturbed for millions of years.

Ans. (a) Assertion and Reason are true and Reason is the correct explanation of Assertion.

16. Assertion: Decrease in species diversity occurs as we ascend a high mountain.

Reason: Decrease in species diversity occurs with increase in altitude due to rise in temperature.

Ans. (c) Assertion is true but Reason is false.

SECTION-B

17. Observe the pyramid and answer the following questions.

(a) Name two ecosystems in which such a pyramid is found.

(b) Name two producers:



OR

What is the cross between the progeny of F1 and the homozygous recessive parent called? How is it useful? 2

(a) Ecosystems : Tree ecosystem and Marine ecosystem

(b) Producers : Tree, Phytoplanktons

OR

Test cross and useful to identify the genotype (genetic makeup) of a plant whose phenotype (visible expression) is known.

18. Write the names of the following: 2

(a) A 15 mya primate that was ape-like

(b) A 2 mya primate that lived in East African grasslands

- (a) Dryopithecus
(b) Australopithecus / Homo habilis

19. What is Biopiracy? Describe the factors that lead to biopiracy. Why do some nations develop laws to prevent such unauthorized exploitation of their bio-resources and traditional knowledge? 2

Biopiracy:

Biopiracy is the use of bio-resources by multinational companies and other organizations without proper authorization from the countries and people concerned without compensatory payment.

Factors that lead to biopiracy

Most of the industrialized nations are rich financially but poor in biodiversity and traditional knowledge.

In contrast the developing and the underdeveloped world is rich in biodiversity and traditional knowledge related to bio-resources.

20. Water is very essential for life. Write any four features of plants which enable them to survive in water scarce environment. 2

OR

What is meant by interference competition? Explain giving an example. 2

1. Deep tap roots
2. Deciduous leaves
3. Waxy cuticle
4. Sunken stomata
5. Succulence to store water
6. C4 Pathway of Photosynthesis

21. Interference competition? Explain giving an example. 2

Even if the resource is abundant, the feeding efficiency of one species is reduced by the interfering and inhibitory presence of other species.

Abington tortoise in Galapagos Islands became extinct within a decade after goats were introduced in the island.

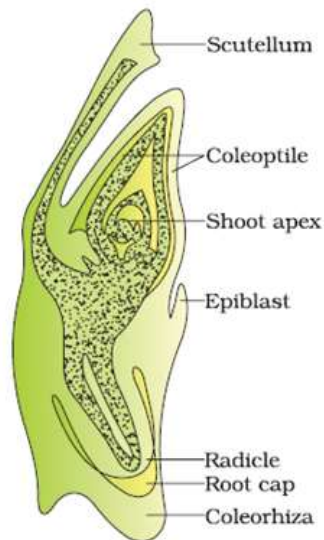
SECTION-C

22. Draw a diagrammatic view of a mature anatropous ovule and label any six parts in it. 3



OR

Draw the L.S. of an embryo of grass and label any six parts in it.



23. (a) **What is apomixis and what is its importance?**
 (b) **Why should hybrid seeds be produced every year?**
 (c) **If apomictic genes were introduced into the hybrids, what will be the advantage?** 3
- (a) Apomixis is the mechanism of seed production without involving the process of meiosis and syngamy.
 It plays an important role in hybrid seed production.
- (b) If the seeds collected from hybrids are sown, the plants in the progeny will segregate and do not maintain hybrid characters.

- (c) If the hybrids are made into apomicts. There is no segregation of characters in the hybrid progeny.

Then the farmers can keep on using the hybrid seeds to raise new crop year after year and he does not have to buy hybrid seeds every year.

24. Copper ions-releasing IUDs are more efficient than non-medicated methods. Why? 3

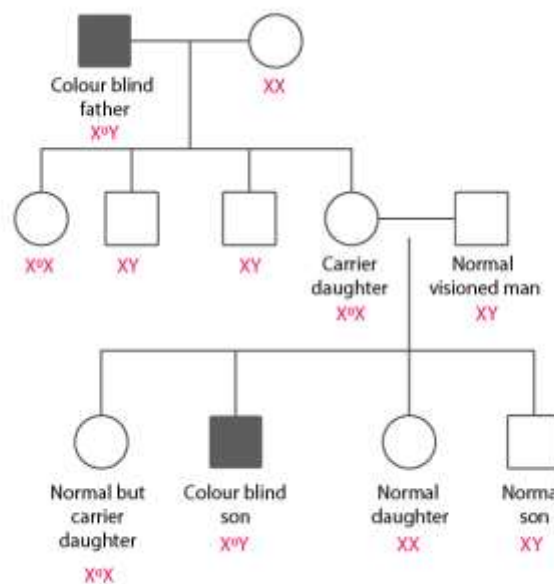
Copper ions released suppress **sperm motility** and **fertilizing capacity** of sperms.

It increases the **phagocytosis** of sperms within the uterus and act as a spermicide.

They are one of the safest, most effective and least expensive method.

25. A normal visioned woman, whose father is colour blind, marries a normal visioned man. What would be the probability of her sons and daughters to be colour blind? Explain with the help of a pedigree chart. 3

The colour blindness is a disease which can be passed from parents.



26. (a) Differentiate between analogous and homologous structures.

(b) Select and write analogous structures from the list given below:

- (i) Wings of butterfly and birds
- (ii) Vertebrate hearts
- (iii) Tendrils of bougainvillea and cucurbita
- (iv) Tubers of sweet potato and potato

3

- (a) Analogous - Anatomically not similar though perform similar functions / are a result of convergent evolution

Homologous - Anatomically similar (but perform different functions) / are a result of divergent evolution

- (b) Option (i) Wings of butterfly and birds
(iv) Tubers of sweet potato and potato

27. (a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons? Mention their role. 3

- (a) The first infection of chicken pox produces a primary response and antibodies are generated against chicken pox virus.

Subsequent encounter with the same virus elicits a highly intensified secondary response, due to the memory cells formed during the first encounter, active immunity

- (b) Proteins secreted by viral infected cells, which protects non-infected cells from viral infection

When α - interferon is given to cancer patient (it activates immune system), destroys tumour.

28. (a) Can you suggest a method to remove oil (hydrocarbon) from seeds based on your understanding or rDNA technology and chemistry of oil? 3

(b) Can insulin be orally administered in a diabetic patient? Justify your answer.

- (a) Oil is a lipid and its removal can be only by enzyme lipase.

The gene encoding the protein/enzyme lipase from a microbe can be isolated or the gene can be synthesised in vitro.

The gene can be introduced into the plant that produces the oily seeds.

It can be expected that the enzyme will degrade oil and the seed will be free of oil.

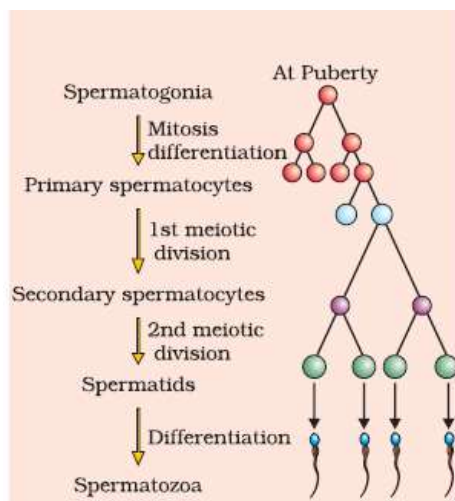
- (b) Insulin cannot be administered orally in a diabetic patient.

It is because insulin being a polypeptide will be digested in our alimentary canal by the proteases and peptidases into its constituent amino acids.

SECTION-D

29. Observe the given figure and answer the following questions.

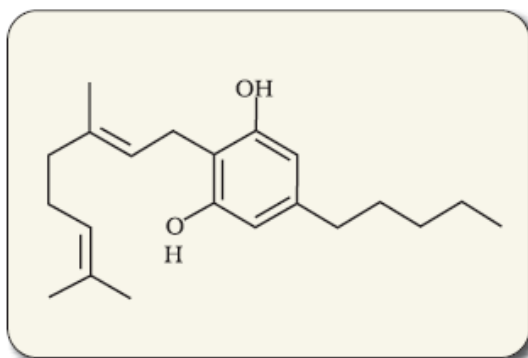
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- (a) Which cell division occurs during the multiplication of spermatogonia?
 (b) How many chromosomes are present in secondary spermatocyte and spermatid respectively?
 (c) Which hormone stimulate the process of spermatogenesis?
 Name the process by which spermatids are transformed into sperms.

- (a) Mitosis
 (b) 23 Chromosomes
 (c) Androgens
 Spermiogenesis

30. Observe and identify the given drug and answer the following questions. 4



- (a) Which group of drugs does this represent? Name the plant from which it is obtained.

- (b) What are the modes of consumption of these drugs?
(c) Which organ of the body is affected by consumption of these drugs.
Name any two drugs of this group.

- (a) Cannabinoids
(b) Taken by inhalation and oral ingestion.
(c) It affects the cardiovascular system of the body.
Marijuana, hashish, charas and ganja.

SECTION-E

31. Give an account of the Hershey and Chase experiment. What did it conclusively prove? Explain with illustration. 5

Hershey and Chase worked to discover whether it was protein or DNA from the viruses that entered the bacteria.

They grew some viruses on a medium that contained radioactive phosphorus and some others on medium that contained radioactive sulfur.

Viruses grown in the presence of radioactive phosphorus contained radioactive DNA but not radioactive protein because DNA contains phosphorus but protein does not.

Bacteria which was infected with viruses that had radioactive DNA were radioactive, indicating that DNA was the material that passed from the virus to the bacteria.

Bacteria that were infected with viruses that had radioactive proteins were not radioactive.

This indicates that proteins did not enter the bacteria from the viruses. DNA is therefore the genetic material that is passed from virus to bacteria.

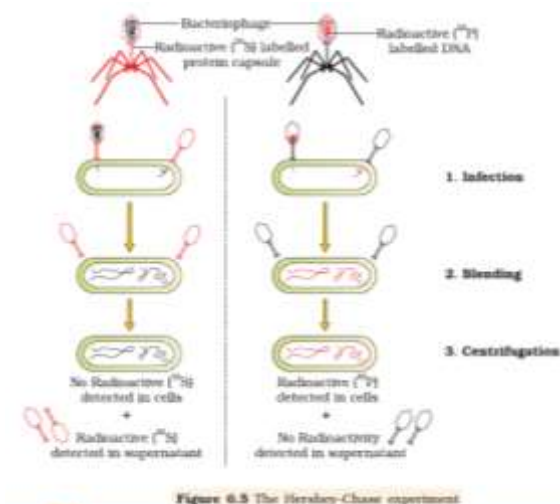


Figure 6.5 The Hershey-Chase experiment

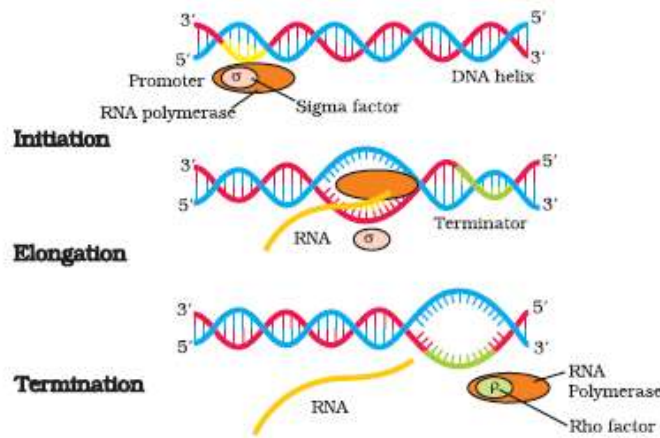
(a) Describe the process of transcription in bacteria with the help of a labelled diagram.

(b) Explain the processing the hnRNA needs to undergo before becoming functional mRNA in eukaryotes.

(a) **Initiation:** Enzyme(DNA dependent RNA polymerase)RNA polymerase binds with sigma factor and attaches to the promoter site ie 5' site of the DNA.

Elongation: When RNA polymerase moves from promoter to the terminator site it causes the polymerisation of nucleoside triphosphates / Nucleotides resulting in the formation of RNA (in the 5'-3' direction).

Termination: RNA Polymerase on reaching the terminator site binds to ρ factor and the (nascent transcribed) RNA falls off along with RNA polymerase



(b) hnRNA undergoes splicing where introns are removed and exons are joined in a defined order.

hnRNA undergoes additional processing i.e capping (addition of methyl guanosine triphosphate to the 5'end), tailing (200-300 poly adenylate residue are added to the 3' end).

32. (a) What are flocs? Describe how 'flocs' and 'activated sludge' help in sewage treatment.

(b) Draw a neat and labelled diagram of a biogas plant.

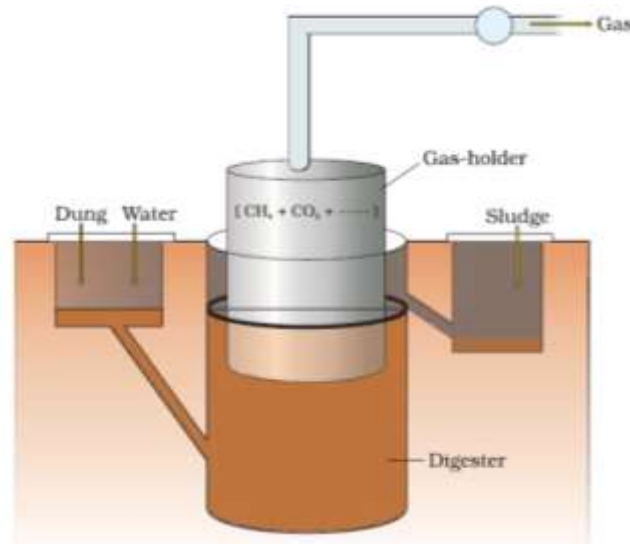
Flocs are masses of aerobic bacteria associated with fungal filaments to form mesh like structures. 1

These aerobic microbes consume the major part of the organic matter in the effluent. This significantly reduces Biological oxygen demand (BOD) of the effluent. 1

A small part of the activated sludge is used as inoculum and pumped back to aeration tank.

The remaining major part of the sludge is pumped into anaerobic sludge digesters where microbes or bacteria grow anaerobically to produce CH₄ or H₂S or CO₂ or biogas. 1

(b) Labelled diagram 2



OR

- (a) **Organic farmers prefer biological control of diseases and pests to the use of chemicals for the same purpose. Justify.**
- (b) **Give an example of a bacterium, a fungus and a virus that are used as biocontrol agents.**

- (a) - Reduces dependence on toxic chemicals
 - Protects our ecosystem or environment
 - Protects and conserves non-target organisms / they are species - specific
 - These chemicals being non-biodegradable may pollute the environment Permanently
 - These chemicals being non-biodegradable may cause biomagnification.

(b)

No	Type	Organisms	Pathogens
1	Bacteria	<i>Bacillus thuringiensis</i>	Caterpillars
2	Fungus	<i>Trichoderma</i>	Plant Pathogens
3	Virus	Baculoviruses	Insects

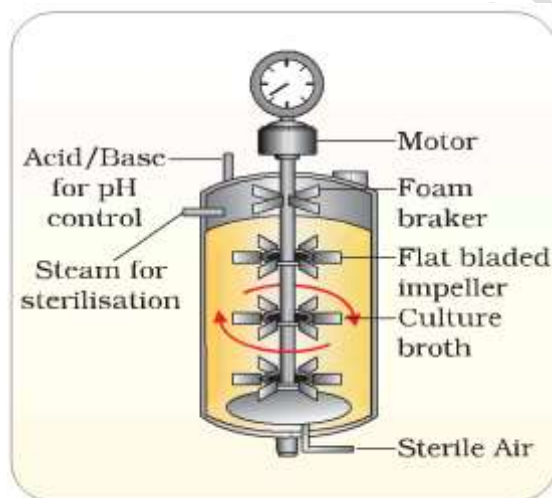
33. Why is *Agrobacterium tumefaciens* a good cloning vector?

Explain the importance of (a) ori (b) amp^R and (c) rop in the *E. coli* vector shown below:

Draw a neat diagram of a simple stirred-tank bioreactor and labell any six parts. 5

Agrobacterium tumefaciens is a pathogen of several dicot plants. Its Ti plasmid is modified into a cloning vector. This modified Ti plasmid is non-pathogenic and is easily used for delivering a variety of genes into different plants.

- (a) Ori is the origin of replication.
- (b) amp^R is Ampicillin antibiotic resistant gene.
- (c) rop is a gene for producing the proteins involved in the replication of the plasmid.

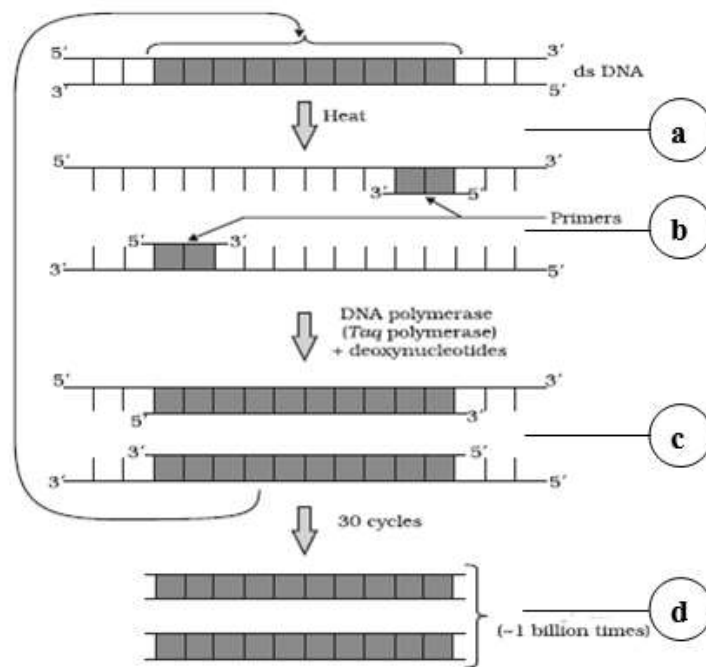


OR

(i) How are the following used in Biotechnology?

- (a) Plasmid DNA
- (b) Recognition sequence
- (c) Bioreactors

(ii) Complete the labeling in the following PCR.



(a) Plasmid DNA:

It is often used for constructing recombinant DNA by ligating the gene of interest with it. It is used as cloning vector.

(b) Recognition sequence:

These are the sequences of DNA, where a specific restriction enzyme cuts the DNA.

(c) Bioreactors:

Bioreactors are vessels in which large volumes (100-1000 litres) of raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal or human cells.

ii	a	Denaturing
	b	Annealing
	c	Extension
	d	Amplification
