Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 5

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. All questions are compulsory.
2. The question paper has five sections and 33 questions. All questions are compulsory.
3. Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
4. 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.
5. Wherever necessary, neat and properly labeled diagrams should be drawn.

Section A

1. In a grazing food chain, carnivores may also be referred to as: **[1]**

   a) Primary producers
   b) Secondary consumers
   c) Secondary producers
   d) Primary consumers

2. To speed up the malting process in brewing industry, the growth hormone used is: **[1]**

   a) Kinetin
   b) Auxin
   c) Gibberllic acid
   d) Ethylene

3. Cyanobacteria are useful biofertilizers in the fields of: **[1]**

   a) Rice
   b) Wheat
   c) Sugarcane
   d) Maize

4. If the carbon atoms fixed by producers already have passed through three species, the organisms of the trophic level of the last species would be: **[1]**

   a) secondary consumer
   b) tertiary producer
   c) tertiary consumer
   d) scavenger

5. Choose the correct statement regarding the ZIFT procedure: **[1]**

   a) Ova collected from a female donor are transferred to the fallopian tube to facilitate zygote formation.
   b) Ova collected from a female donor and transferred to the uterus.
   c) Zygote is collected from a female donor and
   d) Zygote is collected from a female donor and

transferred to the fallopian tube. transferred to the uterus.

6. **Assertion (A): Reproductive and Child Health (RCH) Care Programmes** creating awareness among people about various reproduction-related aspects. **[1]**

Reason (R): With the help of audio-visual and print media governmental and non-governmental agencies have taken various steps to create awareness among the people about reproduction-related aspects.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

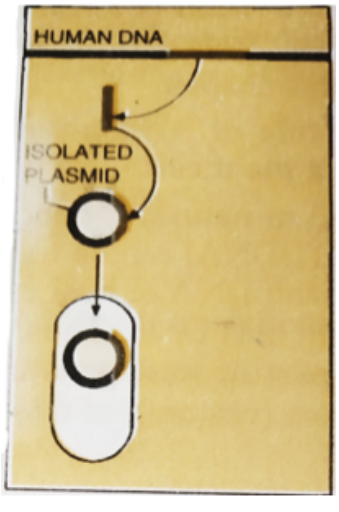
7. Which one of the following trait of pea plants studied by mendel is dominant? **[1]**

a) Terminal pod colour
b) Green pod colour
c) Yellow pod colour
d) White pod colour

8. Which one of the following pairs of geographical areas show maximum biodiversity in our country ? **[1]**

a) Eastern Ghasts and West Bengal
b) Kerala and Punjab
c) Eastern Himalaya and Western Ghats
d) Sunderbans and Rann of Kutch

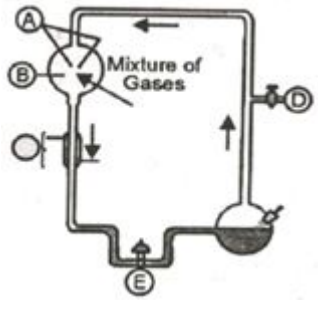
9. Arrange the following steps that are shown in the figure: **[1]**



1. The plasmid is taken up into a bacterial cell which makes protein directed by human DNA
2. DNA segment incorporated into the bacterial plasmid
3. The segment of DNA removed from human cell
4. In Genetic engineering (Recombinant DNA technology)

a) $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$
b) $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
c) $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$
d) $2 \rightarrow 3 \rightarrow 4 \rightarrow 1$

10. What was the mixture of gases used in chamber marked A? **[1]**



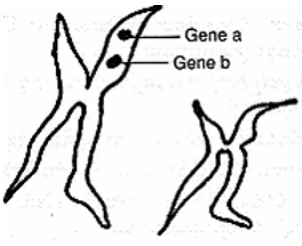
a) Oxygen O_2, ammonia (NH_3), hydrogen H_2, and water H_2O

b) Oxygen O_2, ozone O_3, hydrogen H_2

c) Methane(CH_4) v, ammonia(NH_3), hydrogen H_2 and water H_2O

d) Oxygen O_2, ozone O_3, hydrogen H_2, and water H_2O

11. Given below is a highly simplified representation of human sex chromosomes from a karyotype. The genes a and b could be of: **[1]**



a) Attached ear lobe and Rh blood group

b) Haemophilia and red green colour blindness

c) Colour blindness and body height

d) Phenylketonuria and haemophilia.

12. Which technique is routinely used in HIV detection? **[1]**

a) Gel electrophoresis

b) GEAC

c) PCR

d) DNA sequencing

13. Which of the following is a technique of direct introduction of gametes into the oviduct: **[1]**

a) ET

b) MTS

c) POST

d) GIFT

14. **Assertion (A):** In molecular diagnosis, single stranded DNA or RNA tagged with radioactive molecule is called a probe. **[1]**

Reason (R): A probe always searches and hybridises with its complementary DNA in a clone of cells.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion:** Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes are used. **[1]**

Reason: Cheese is manufactured by the use of different types of microbes like bacterias or fungi.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

16. **Assertion (A):** Decomposition process is slower if detritus is rich in lignin and cutin. **[1]**

Reason (R): Decomposition is largely an oxygen requiring process.

a) Both (A) and (R) are true and (R) is the correct explanation of (A).

b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

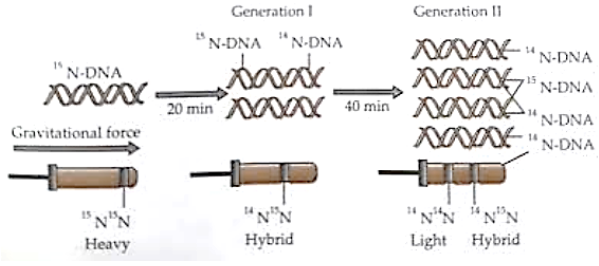
c) (A) is true, but (R) is false.

d) (A) is false, but (R) is true.

Section B

17. Why has the Indian Parliament cleared the second amendment of the country's patent bill? **[2]**

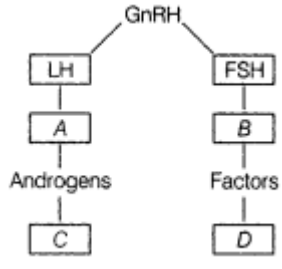
18. Results of the famous experiment given in the figure. Answer the question: **[2]**



a. Identify the given experiment.

b. Which property of the DNA is proved by this experiment?

19. Identify A, B, C and D with reference to gametogenesis in humans, in the flow chart given below. **[2]**

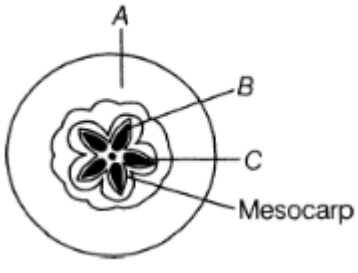


20. Name the group of organisms and the substrate they act on to produce biogas. **[2]**

OR

Common yeast is known as Baker's yeast and also as Brewer's yeast. Justify.

21. i. Given below is a TS of an apple. Identify A, B, and C. **[2]**



ii. Why is an apple categorised as a false fruit?

Section C

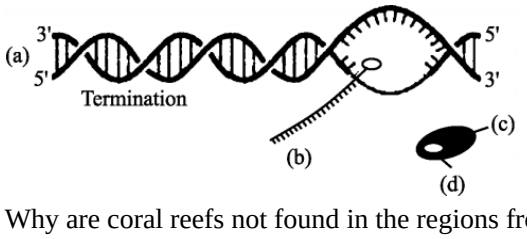
22. A patient complains of suffering from constipation, stomach ache, stool with blood clots and excess mucous. The physician diagnosed it as amoebiasis, after stool test. **[3]**

a. Write the scientific name of the microbe identified in the stool sample.

b. How do you think, the patient must have contracted it?

c. Write your suggestions to the patient to avoid infection in future.

23. The process of termination during transcription in a prokaryotic cell is being represented here. Name the label a, b, c and d. **[3]**



24. Why are coral reefs not found in the regions from west Bengal to Andhra Pradesh but are found in Tamil Nadu and on the east coast of India? **[3]**

25. Mention any two autosomal genetic disorders with their symptoms. **[3]**

26. Given below is an equation describing the Species-Area relationship between species richness and area for a wide variety of taxa as angiosperm plants, birds, bats etc. **[3]**

$$S = CA^z$$

a. Give a graphical representation of the given equation showing Species-Area relationship.

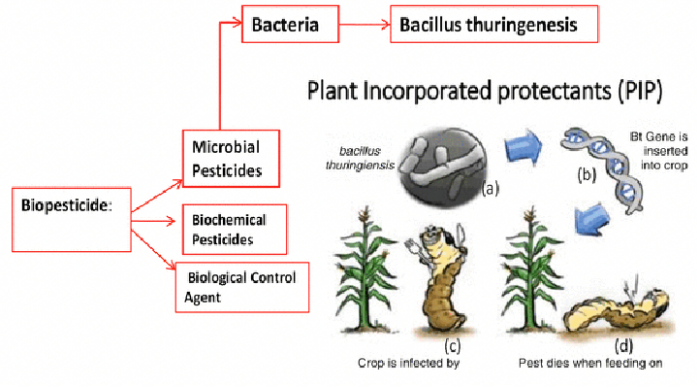
b. What does **S** represent in the given equation?

c. What is the value of **Z** (regression coefficient) for frugivorous birds and mammals in the tropical forests of different continents?

OR

Explain rivet popper hypothesis. Name the ecologist who proposed it.

27. The image below describes the types and the process of bio-pesticides. **[3]**



i. What is meant by the term bio-pesticide?

ii. Name and explain the mode of action of a popular bio-pesticide.

28. How does industrial melanism in Biston betularia illustrate the action of natural selection? Explain briefly. **[3]**

Section D

29. **Read the following passage and answer the questions that follow.** **[4]**

In 1981, the health workers of United States of America had become aware of the increased frequency of Kaposi's sarcoma, cancer of the skin and blood vessels and another disease pneumocystis pneumonia, a respiratory infection caused by a protozoan. Both these diseases were very rare in the general population, but occurred frequently in more severely "immunosuppressed" individuals. This led to the recognition of the immune system disorder that was named Acquired Immune Deficiency Syndrome (AIDS).

In 1983, virologists working in the USA and France had identified a causative agent for 'AIDS', now known as Human Immunodeficiency Virus (HIV). 'HIV' follows a set path to attack the human body to cause the disease.

a. Name the group of cells the HIV attacks after gaining entry into the human body and write the various events that occur within this cell. **(1)**

b. Write the expanded form of the diagnostic test used for detecting AIDS. Write the possible treatment available for the disease at present. **(1)**

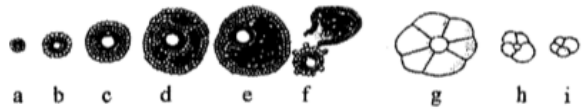
c. Mention any two steps suggested by WHO for preventing the spread of this disease. **(2)**

OR

"A patient suffering from AIDS does not die of this disease but from some other infection." Justify the statement. **(2)**

30. **Read the following text carefully and answer the questions that follow:** **[4]**

The following is the illustration of the sequence of ovarian events **a** to V in a human female:



i. Identify the figure that illustrates corpus luteum and name the pituitary hormone that influences its formation. (1)

ii. Specify the endocrine function of corpus luteum. How does it influence the uterus? Why is it essential? (1)

iii. What is the difference between **d** and **e**? (2)

OR

Draw a neat labelled sketch of mature oocyte. (2)

Section E

31. Illustrate the design of a bioreactor. Highlight the difference between a flask in your laboratory and a bioreactor which allows cells to grow in a continuous culture system. **[5]**

OR

i. Why should a cell be made competent to take up an alien DNA? How can a bacterial cell be made competent using calcium ions? Explain.

ii. 1. State the importance of gel electrophoresis in biotechnology.
2. Explain the principle on which this technique works.
3. Mention why ethidium bromide is used in this technique.

32. Explain the process of microsporogenesis in angiosperms. **[5]**

OR

i. Mature seeds of legumes are non-albuminous. Then, can it be assumed that double fertilisation does not occur in legumes? Explain your answer.

ii. List the differences between the embryos of dicot (pea) and monocot (grass) families.

33. a. List any four major goals of Human Genome project. **[5]**

b. Write any four ways the knowledge from HGP is of significance for humans.

c. Expand BAC and mention its importance.

OR

a. Why did Hershey and Chase use ^{35}S and ^{32}P in their experiment? Explain.

b. State the importance of blending and centrifugation in their experiment.

c. Write the conclusion they arrived at after completing their experiment.

Solution

Section A

1. **(b)** Secondary consumers
   Explanation:
   Secondary consumers

2. **(c)** Gibberllic acid
   Explanation:
   Gibberllic acid

3. **(a)** Rice
   Explanation:
   Rice

4. **(c)** tertiary consumer
   Explanation:
   Green plants occupy the first trophic level(producers). Primary consumers(herbivores) feed on producers. Secondary consumers(primary carnivores) feed on herbivores. Tertiary consumers(secondary carnivores) feed on secondary consumers. If the carbon atoms fixed by producers already have passed through three species, the organisms of trophic level of the last species would be tertiary consumers.

5. **(c)** Zygote is collected from a female donor and transferred to the fallopian tube.
   Explanation:
   The zygote or early embryos (with up to 8 blastomeres) could then be transferred into the fallopian tube (ZIFT–zygote intrafallopian transfer) and embryos with more than 8 blastomeres, into the uterus (IUT – intrauterine transfer), to complete its further development.

6. **(a)** Both A and R are true and R is the correct explanation of A.
   Explanation:
   Both A and R are true and R is the correct explanation of A.

7. **(b)** Green pod colour
   Explanation:
   Green pod colour

8. **(c)** Eastern Himalaya and Western Ghats
   Explanation:
   Eastern Himalaya and Western Ghats

9. **(c)** $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$
   Explanation:
   $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

10.

(c) Methane(CH_4) v, ammonia(NH_3), hydrogen H_2 and water H_2O

Explanation:

the gases used in Urey and Miller experiment in chamber marked A are Methane (CH_4), ammonia (NH_3), hydrogen H_2, and water H_2O

11.

(b) Haemophilia and red green colour blindness

Explanation:

Haemophilia and red-green colour blindness both are a sex-linked recessive gene on X chromosome. Body height is an example of polygenic inheritance. Rhesus blood group is base on the presence or absence of Rh-protein on the surface of RBC, phenylketonuria (PKU) is a recessive autosomal variation.

12.

(c) PCR

Explanation:

Polymerase chain reaction (PCR) tests are used to detect HIV's genetic material, called RNA. These tests can be used to screen the donated blood supply and to detect very early infections before antibodies have been developed. This test may be performed just days or weeks after exposure to HIV.

Although these tests are the most accurate, they are not performed as often as the other HIV tests because they are expensive and also time- and labor-intensive.

13.

(d) GIFT

Explanation:

Gamete Intrafallopian Transfer (GIFT) is a technique where gametes (sperm and egg) are directly introduced into the oviduct (fallopian tube) for fertilization to occur naturally inside the body. This is different from in vitro fertilization (IVF), where fertilization occurs outside the body.

14. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation:

Both A and R are true and R is the correct explanation of A.

15. **(a)** Assertion and reason both are correct statements and reason is correct explanation for assertion.

Explanation:

Assertion and reason both are correct statements and reason is the correct explanation for assertion.

16.

(b) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

Explanation:

Both (A) and (R) are true, but (R) is not the correct explanation of (A).

Section B

17. Amendments to the patent bill have empowered India to prevent unauthorized exploitation of our bio-resources and traditional knowledge by other countries. This bill also considers patent terms and initiated research development in this field.

18. a. The given diagram is representing "Messelson and Stahl's experiment". It is proven that DNA replicates semi conservatively.
    b. The strands of DNA are of intermediate density. The double-stranded DNA is $\frac{1}{2}$ Heavy and $\frac{1}{2}$ Light.

19. A- Leydig's cell
    B- Sertoli cell
    C- Spermatogenesis (Formation of sperms)
    D- Spermiogenesis (Transformation of spermatid into sperm)

20. Methanogens are anaerobic unicellular organisms, that release methane as a waste product of cellular metabolism.
Substrate: Cellulosic materials / cow dung.

OR

Common yeast is employed in the fermentation of -
(i) dough, used for making bread, cakes in bakeries.
(ii) Fruit juices and malt in breweries for the production of alcoholic beverages,
hence it is known as both as baker's and brewer's yeast.

21. i. A - Thalamus, B - Seed, C - Endocarp.
ii. In apple, along with the ovary the thalamus also contributes to fruit formation. So, apple is called false fruit.

Section C

22. a. Amoebiasis; an infection of the large intestine caused by a protozoan, Entamoeba histolytica
b. Source of infection:
i. Cysts from the faeces of infected person
ii. Contaminated raw vegetables, fruits and other food stuffs.
iii. Through contaminated water.
c. The infection can be avoided by
i. Proper sanitary disposal of faecal matter.
ii. Perfect sanitation and protection of water and vegetables from pollution.
iii. Washing hands regularly.

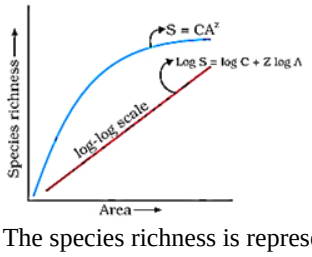
23. a. DNA molecule
b. mRNA transcript
c. RNA polymers
d. Rho factor

24. In West Bengal and Andhra Pradesh, freshwater is released from the Ganges and some other rivers. Due to this, coral reefs are not found in regions from West Bengal to Andhra Pradesh. From Tamil Nadu to the southern tip of the east coast, coral reefs are present because of no interference from freshwater.

25. Sickle cell anaemia and Down's syndrome Symptoms of Sickle cell anaemia: the RBCs of the sufferer become elongated (sickle shaped) and curved under low O_2 tension. The sickled RBCs are destroyed more rapidly than the normal ones leading to anaemia.

Symptoms of Downs Syndrome: The affected individual is short stature with small round head, furrowed tongue and partially open mouth. Physical and mental development is retarded.

26. a. The given equation's graphical representation of the relationship between species and area is as follows:



b. The species richness is represented by S in the given equation.
c. The regression coefficient Z is the slope of the line. The slope is found to be 1.15 for frugivorous (fruit-eating) birds and mammals in tropical woods on various continents.

OR

Rivet Popper Hypothesis

i. The hypothesis was proposed by Paul Ehrlich.
ii. In an airplane (ecosystem), all parts are joined together using thousands of rivets (species).
iii. If every passenger travelling in it, starts popping a rivet to take home (causing a species to become extinct), it may not affect the flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak after some time.
iv. Further, which rivet is removed may also be critical loss of rivets on the wings. (Key species that drive major ecosystem function) is obviously a more serious threat to flight safety than the loss of a few rivets on the seats or windows inside the plane.

27. Biopesticide is a pesticide which is
i. Not chemical in nature.

ii. More specific in action against the pest.

iii. Safer for the environment than chemical pesticides.

A popularly known bio-pesticide is Bt toxin, which is produced by a bacterium called Bacillus thuringiensis. Bt toxin gene has been cloned from this bacterium and expressed in plants. Bt-toxin protein when ingested by the insect, gets converted to its active form due to the alkaline pH of the gut. The activated toxin binds to the surface of midgut epithelial cells and creates pores that cause cell swelling and lysis and eventually kills the insect.

28. Industrial Melanism is an adaptation, where the moths living in the industrial area developed melanin pigments to match their body to the tree trunk that were covered with black soot. Before industrialization, in Great Britain, it was observed that there were more white winged moths. However after industrialization the white coloured lichen covered the tree trunks. In that background the white winged moths survived but the dark coloured moths were eaten by predators. During the post industrialization periods the tree trunks became dark due to industrial smoke and soots. Under such conditions, the white winged moths did not survive due to predators and dark winged moths survived. In areas where industrialization did not occur, the count of moths were low. Thus, industrial melanism supports evolution by natural selection.

Section D

29. a. Macrophages, virus replication (RNA genome)

b. Enzyme-linked immuno-sorbent assay (ELISA)/Polymerase Chain Reaction (PCR)

Treatment available - Antiviral drugs that are only partially effective as they only prolong the life of the patient.

c. Making blood HIV safe in blood banks, use of only disposable needles and syringes in hospitals, free distribution of condoms, controlling drug abuse, advocating safe sex, regular check-ups for HIV susceptible population.

OR

A patient suffering from AIDS does not die of this disease but from some other infection because of drastic reduction of helper T-lymphocytes that are responsible to fight infections, person become immune-deficient, unable to protect oneself from other bacterial or viral or fungal or parasitic infection

30. i. Stage 'g' represents the developing corpus luteum. Luteinising hormone (LH) secreted by pituitary help in its formation.

ii. The corpus luteum secretes a large amount of hormone progesterone. It is essential for the maintenance of endometrium of the uterus. It is a necessity for implantation and for pregnancy.

iii. Stage ‘d’ represents the tertiary follicle with a small cavity-antrum. It is surrounded by many layers of granulosa cells. It contains primary oocyte (meiosis-I arrested at prophase-I) stage V represents the mature follicle called Graafian follicle with a fluid-filled cavity antrum. It contains secondary Oocyte and a tiny first polar body.

The mature follicle is surrounded by theca externa and theca interna. It bursts to release secondary oocyte (Ovulation)

OR

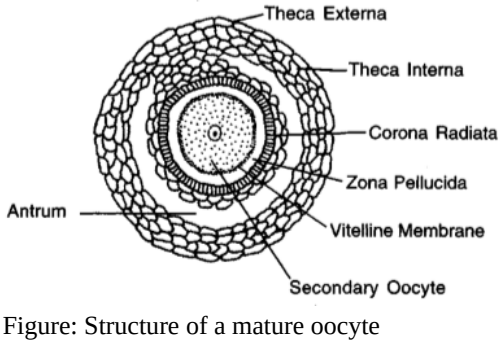
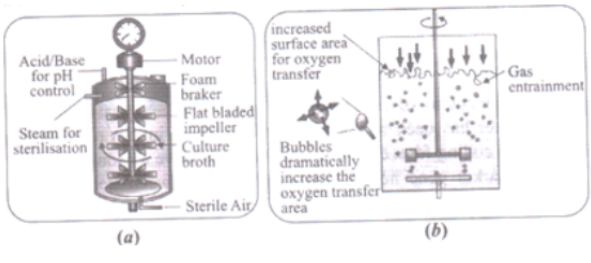


Figure: Structure of a mature oocyte

Section E

31. 

a. Simple stirred-tank bioreactor;

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

Structure of Bioreactor:

i. It is a cylindrical structure with a curved base.

ii. A stirrer is present for even mixing and oxygen availability throughout the reactor.

iii. There is an agitator system, an oxygen delivery system, a foam control system, a temperature control system, etc.
iv. There is a sampling port through which small volumes of culture can be taken out periodically.

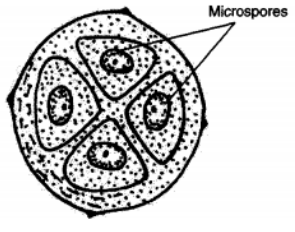
A flask in a laboratory cannot be used for producing recombinant DNA on a large scale. Unlike a bioreactor; a flask can not be used to grow culture continuously.

OR

i. DNA is a hydrophilic molecule and cannot pass through the cell membrane.
A bacterial cell is made competent by treating the bacterial cell with a specific concentration of a divalent cation such as calcium, which increases efficiency with which the DNA enters through pores in its cell wall/This creates certain transient pores in its cell and increases the efficiency of the cell to take up DNA.

ii. 1. Separation of DNA fragments.
2. DNA fragments are negatively charged molecules, they can be separated according to their size by forcing them to move toward the anode under an electric field through agarose gel.
3. Ethidium bromide is used in this technique to stain the DNA to visualize by exposure to UV radiation.

32. **Microsporogenesis**: Sporogenous cells fill the whole interior of a microsporangium. They divide with the growth of another and increase their number. Ultimately they are transformed into microspore mother cells which are diploid (possess two genomes or double set of chromosomes). The microspore mother cells or microsporocytes develop an internal layer of callose which breaks the plasmodesmal connections among themselves. The separated mother cells round off and undergo meiosis to produce tetrads of haploid microspores or pollen grains. The phenomena is called microsporogenesis. The pollen grains of a tetrad grow and separate from one another. However, they remain attached forming compound pollen grains in Typha. In Calotropis and related plants, all the pollen grains of another lobe remain united in a single sac called pollinium. Two pollinia of adjacent another are attached to produce a translator.



OR

i. Seeds of legumes are non-albuminous that implies that endosperm in such seeds is completely used up in providing nutrition to developing the embryo. The endosperm is formed as a result of triploid fusion, i.e. between a male gamete and two polar nuclei. This making it obvious that it cannot be formed in the absence of double fertilization. Therefore, though the seeds of legumes are non-albuminous, it clearly states the occurrence of double fertilization in them.

ii. The differences between the embryos of pea and grass can be summarised as follows

Dicot embryo (Pea)	Monocot embryo (Grass)
The basal cell forms a 6-10 celled suspension.	Basal cell produces a single-celled suspension.
The terminal cell produces an embryo, except the radicle.	Forms the whole of the embryo.
The first division of terminal cell is longitudinal	The first division is transverse.
It possesses two cotyledons.	It possesses one cotyledon.
Plumule is terminal and is present between the elongated cotyledons.	Plumule is laterally present to excessive growth of single cotyledon.

33. a. Some of the important purposes of the Human Genome Project were as follows:
i. Identify all the approximately 20000-25000 genes In human DNA,
ii. Determine the sequences of the 3 billion chemical base pairs that make up human DNA,
iii. Stole this Information in databases,
iv. Improve tools for data analysis,
v. Address the ethical legal and social issues (ELSI) that may arise from the project

b. Four ways the knowledge from HGP is of significance for humans are:
i. agricultural production
ii. environmental remediation
iii. prevents disorders

iv. diagnosed disorder

c. BAC- bacterial artificial chromosomes
It is used for the cloning of DNA fragments.

OR

a. Radioactive phosphorus (^{32}P) to make the DNA of the bacteriophage radioactive
Radioactive Sulphur (^{35}S) to make the protein of the bacteriophage radioactive.

b. Blending- Radioactive phages allowed to attach to E.coli, as the infection proceeded the viral coats were removed from bacteria by blending.
Centrifugation- the virus particles were separated from bacteria by (spinning them in a centrifuge) centrifugation.

c. Bacteria that were 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.