Class XII Session 2025-26
Subject - Biology
Sample Question Paper - 2

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. The loss of energy as one proceeds from one trophic level to the next trophic level is approximately: **[1]**

   a) 40% b) 60%

   c) 90% d) 30%

2. Which one is not a natural method of birth control. **[1]**

   a) Rhythm period b) Tubectomy

   c) Coitus interrupts d) To abstain

3. Androgenic haploids are used for: **[1]**

   a) Knowing effect of all genes. b) Preparation of homozygous diploids.

   c) Induction of mutations. d) Raising stock for micropropagation.

4. When natality is balanced by mortality. There will be **[1]**

   a) Over population b) Zero population growth.

   c) Increase in population growth. d) Decrease in population growth.

5. Most industrialized nations are rich financially but poor in: **[1]**

   a) Traditional knowledge and land requirement b) Health and manpower

   c) Biodiversity and traditional knowledge d) Population

6. Bacteria which converts milk into curd is: **[1]**

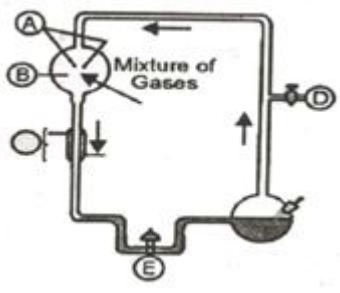
   a) Closteridium b) Streptococcus

   c) Lactobacillus d) Spirillium

7. When two genes are situated very close to one another on a chromosome: **[1]**

a) Hardly any cross-overs are produced
b) No crossing over can take place
c) Only double cross-over can occur between them
d) The percentage of crossing over between them is very high

8. What was the resultant found in the place marked E? **[1]**

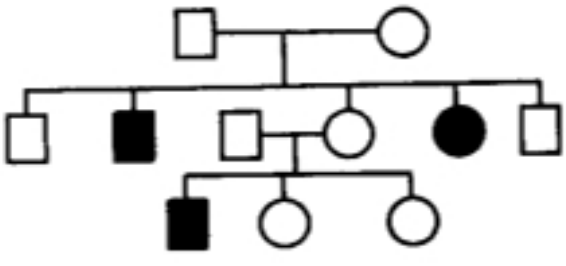


a) Organic esters only
b) Some fatty acids and organic acids
c) Some amino acids as glycine and alanine
d) Glucose, fatty acids and lipids

9. Bacteria and fungi in a forest ecosystem are generally: **[1]**

a) Decomposers
b) Producers
c) Primary consumers
d) Secondary consumers

10. Study the pedigree chart given below: **[1]**



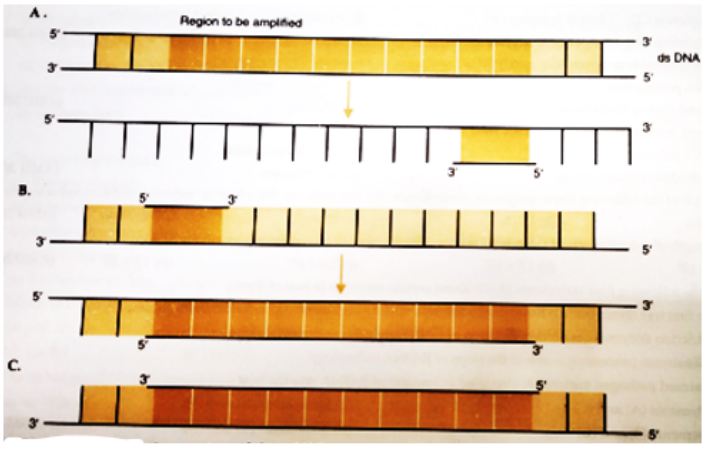
What does it show?

a) Inheritance of a recessive sex-linked disease like haemophilia
b) The pedigree chart is wrong as this is not possible
c) Inheritance of a sex-linked inborn error of metabolism like phenylketonuria
d) Inheritance of a condition like phenylketonuria as an autosomal recessive trait

11. Which one of the following is used as biological insecticide? **[1]**

a) Caterpillar
b) Mazra Poka
c) Tiger beetle
d) Silkmoth

12. The figure below shows three steps (A, B, C) of Polymerase Chain Reaction (PCR). Select the option giving correct identification together with what it represents? **[1]**



a) A - denaturation at a temperature of about 50°C.

b) B - denaturation at a temperature of about 98°C separating the two DNA strands.

c) A - annealing with two sets of primers.

d) C - extension in the presence of heat stable DNA polymerase.

13. **Assertion (A):** Coitus interruptus has a high failure rate for a method of contraception. **[1]**
Reason (R): The pre-ejaculate fluid secreted by bulbourethral glands is known to have sperms.

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.

14. **Assertion (A):** Lichen is important for chemical industries. **[1]**
Reason (R): Litmus and Orcein are formed from lichens.

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 (A):** Kangaroo rats do not drink water. **[1]**
Reason (R): Water is not needed by them.

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.

16. **Assertion (A):** After appearance of oxygen in the atmosphere, methane and ammonia began to disappear. **[1]**
Reason (R): Oxygen is involved in forming ozone layer.

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.

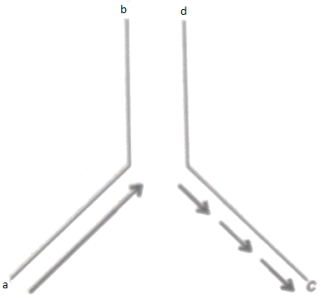
c) A is true but R is false.

d) A is false but R is true.

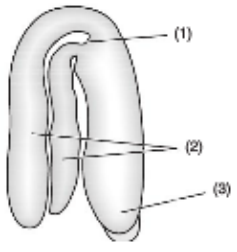
Section B

17. What are transgenic plants? Give some example. **[2]**

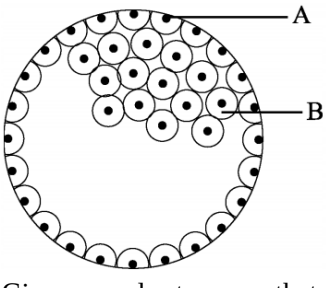
18. Mention the polarity of the DNA strands a - b and c - d shown in the replicating fork given below: **[2]**



19. In the given figure of a typical dicot embryo, label the parts (1), (2) and (3). State the function of each of the labeled part. **[2]**



20. In the given figure, give the name and functions of parts labelled A and B. **[2]**



21. Give examples to prove that microbes release gases during metabolism. **[2]**

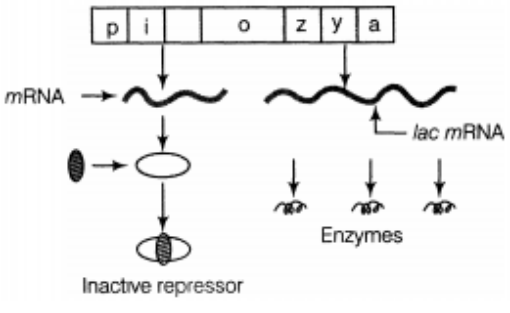
OR

a. Differentiate between humoral and cell mediated immune response.

b. Why is a patient who has undergone organ transplant put on immunosuppressants? Explain.

Section C

22. Study the figure given and answer the questions. **[3]**



i. How does the repressor molecule get inactivated?

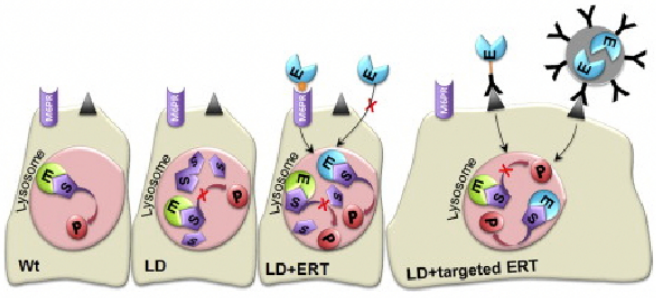
ii. When does the transcription of lac mRNA stop?

iii. Name the enzyme transcribed by the gene z.

23. You must have read in the news paper that some children suffering from Thalesemia became HIV positive due to negligence of a hospital. What negligence has been made on part of hospital authorities in your opinion? **[3]**

24. A population of Paramoecium caudatum was grown in a culture medium. After 5 days the culture medium became overcrowded with Paramoeium and had depleted nutrients. What will happen to the population and what type of growth curve will the population attain? Draw the growth curve. **[3]**

25. The image below eleborates enzyme-replacement therapy. **[3]**



i. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency.

ii. Mention two disadvantages of this procedure.

26. Biodiversity must be conserved as it plays an important role in many ecosystem services that nature provides. Explain any two services of the ecosystem. **[3]**

OR

Bio-diversification of life started to occur almost 3 billion years ago. Since then new species have been evolving and then disappearing en masse from earth.

a. How many episodes of mass extinctions of species have already taken place and which one is in progress in the current era?

b. How is current episode in progress different from the previous episodes and why? Explain.

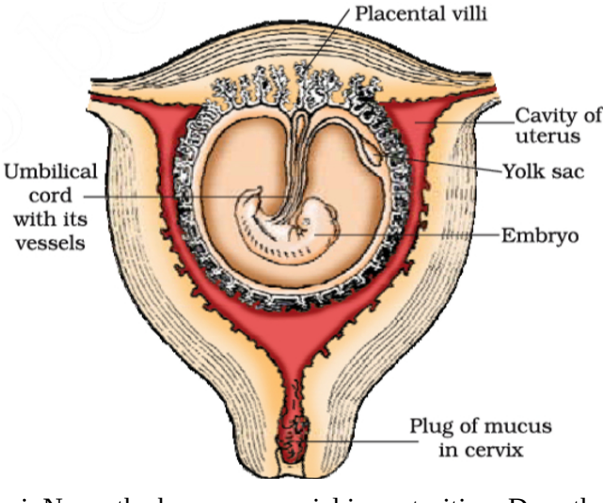
27. How does paleontological evidence support evolution of organisms on Earth? **[3]**

28. Represent schematically the life cycle of a malarial parasite. **[3]**

Section D

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

After implantation, finger-like projections appear on the trophoblast called chorionic villi which are surrounded by the uterine tissue and maternal blood. The chorionic villi and uterine tissue become interdigitated with each other and jointly form a structural and functional unit between the developing embryo (foetus) and the maternal body.



i. Name the hormone crucial in parturition. Does the parturition signal originate from the mother or the fetus? (1)

ii. When and where do chorionic villi appear in humans? (1)

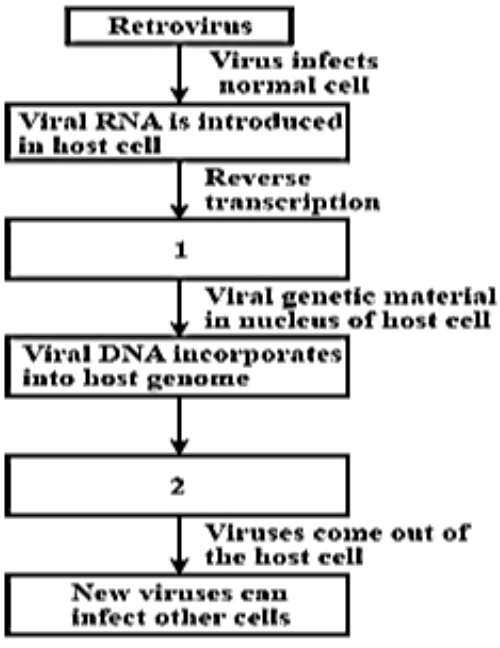
iii. Woman has conceived and implantation has occurred. Discuss the impact of progesterone and estrogen. (2)

OR

Fetal ejection reflex leads to parturition. Justify (2)

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

The diagram shows the replication of the retrovirus in the host.



i. Fill in the missing data in boxes labelled 1 & 2. (1)

ii. Why is it named as retrovirus? (1)

iii. While the virus is being replicated and released, does the infected cell survive and why the virus infected cells prevent spreading of virus to healthy cells? (2)

OR

What is the effect of HIV infection on immune system? (2)

Section E

31. What are the advantages and disadvantages of cross-pollination? **[5]**

OR

A flower of the brinjal plant following the process of sexual reproduction produces 360 viable seeds.

Answer the following questions giving reasons.

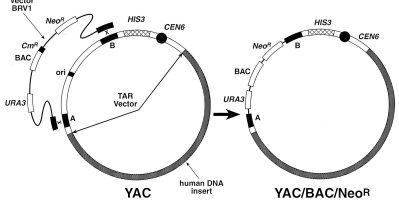
i. How many ovules are minimally involved?

ii. How many megaspore mother cells are involved?

iii. What is the minimum number of pollen grains that must land on stigma for pollination? **OR**

iv. How many male gametes are involved in the above case?

32. Observe the diagram for YAC and BAC vector and answer the questions that follow: **[5]**



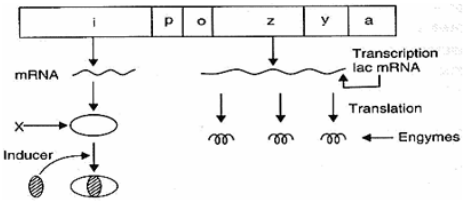
i. What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in the Human Genome Project (HGP)? Mention their role in the project.

ii. Write the percentage of the total human genome that codes for proteins and the percentage of discovered genes whose functions are known as observed during HGP.

iii. Expand SNPs identified by scientists in HGP.

OR

Study the figure given below and answer the following questions:



i. Name the molecule 'X' synthesized by 'i' gene. How does this molecule gets inactivated?

ii. Which one of the structural genes codes for β -galactosidase?

iii. When will the transcription of this gene stop?

33. Explain the role(s) of the following in biotechnology **[5]**

i. Restriction endonuclease

ii. Gel-electrophoresis

iii. Selectable markers in pBR322

OR

a. Explain the different steps carried out in Polymerase Chain Reaction, and the specific roles of the enzymes used.

b. Mention application of PCR in the field of

i. Biotechnology

ii. Diagnostics

Solution

Section A

1. **(c)** 90%
   Explanation:
   90%

2. **(b)** Tubectomy
   Explanation:
   Tubectomy is not a natural method of birth control. In the tubectomy method, a fallopian tube of the female is cut and tied to prevent ovulation. To abstain, coitus interrupts and the rhythm period is a natural method of birth control.

3. **(b)** Preparation of homozygous diploids.
   Explanation:
   Preparation of homozygous diploids.

4. **(b)** Zero population growth.
   Explanation:
   Zero population growth.

5. **(c)** Biodiversity and traditional knowledge
   Explanation:
   Most industrialized nations are rich financially but poor in biodiversity and traditional knowledge. Biodiversity and traditional knowledge related to bio-resources are can be exploited to develop modern applications.

6. **(c)** Lactobacillus
   Explanation:
   Lactobacillus

7. **(a)** Hardly any cross-overs are produced
   Explanation:
   When two genes are situated very close to one another on the chromosome, hardly any cross-over is produced. Such genes are called linkage and do not separate from each other during gamete formation.

8. **(c)** Some amino acids as glycine and alanine
   Explanation:
   In Urey and Miller's experiment, the product formed after the continuous sparking in the mixture of gases at high temperature were some amino acids like glycine and alanine. Sugar and nitrogenous base were also obtained from the same set up by some other scientist.

9. **(a)** Decomposers
   Explanation:

Decomposers

10.

(d) Inheritance of a condition like phenylketonuria as an autosomal recessive trait

Explanation: Inheritance of a condition like phenylketonuria as an autosomal recessive trait

11.

(c) Tiger beetle

Explanation:

Tiger beetle is used as biological insecticides in organic farming practices due to its aggressive predatory habits and running speed.

12.

(b) B - denaturation at a temperature of about 98°C separating the two DNA strands.

Explanation:

B - denaturation at a temperature of about 98°C separating the two DNA strands.

13. **(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.

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

Explanation:

Litmus is an important and widely used dye in chemical laboratories as an acid-base indicator. It is obtained from Rocella montaignei. Orcein, a biological stain, is obtained from Rocella tinctoria.

15.

(c) A is true but R is false.

Explanation:

Certain animals of the dry areas do not drink water at all, e.g. Kangaroo rat. They use water from food and its metabolism to run their body machinery.

16.

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

Explanation:

With the addition of oxygen into the atmosphere methane and ammonia began to disappear as they got oxidised forming CO_2 and N_2 respectively.

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

$4NH_3 + 3O_2 \longrightarrow 2N2 + 6H_2O$

These events ultimately transformed the ancient reducing, oxygen-free atmosphere into the modem oxidizing atmosphere with plenty of free oxygen.

As more oxygen accumulated in the atmosphere, ozone began to appear in the top layers. It developed in the presence of high energy radiations.

$2O_2 + O_2 \longrightarrow 2O_3$.

Section B

17. Transgenic plants are plants that have been genetically engineered, a breeding approach that uses recombinant DNA techniques to create plants with new characteristics.They are identified as a class of genetically modified organism (GMO).
Examples - Bt Cotton, Golden Rice, Flavr Savr tomato.

18. a - b : $3' \rightarrow 5'$ polarity, c - d : $5' \rightarrow 3'$polarity

19. i. Plumule - forms the shoot
ii. Cotyledons - Supply the food material
iii. Radical - Grows into the root

20. A. = Trophoblast - Gets attached to the endometrium and draws nutritive material secreted by uterine endometrium gland.

B. = Inner cell mass - Differentiates as Embryo.

21. The dough, which is used for making dosa and idli is fermented by bacteria. After fermentation the dough shows puffed appearance due to the production of CO_2 gas.

OR

a. **Humoral Immune response**

Elicited / Carried out by B-lymphocytes, which produce antibodies in the blood in response to a pathogen.

Cell mediated immune response

Elicited / Carried out by T-lymphocytes, which help the B-cells to produce antibodies/or destroy pathogen by themselves.

b. Patient are put under immunosupressent to prevent T-cells from recognising foreign tissue / graft as 'non self' and prevent rejection.

Section C

22. i. When an inducer, e.g., lactose binds to the repressor, the repressor is inactivated.

ii. The transcription of lac mRNA stops when lactose becomes exhausted or when there is no need for energy to the cells.

iii. β-galactosidase.

23. During transfusion of blood to thalesemic patient.

• Blood might have been contaminated.

• Sterile needles/ injection were not used

Values

• Critical thinking

• Awareness about health

• Empathy.

24. After the depletion of nutrients(on the fifth day) the population will become finite. The population of Paramoecium will show logistic growth which can be shown by a sigmoid curve. The population growth will show the following phases:

i. Lag phase

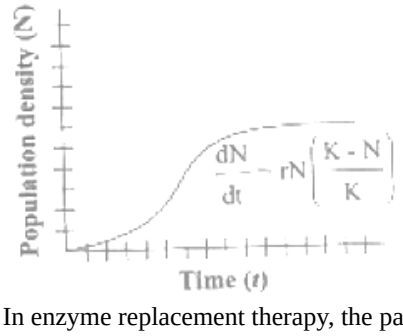
ii. Acceleration phase

iii. Deceleration phase

iv. Asymptote phase

The asymptote phase shall be reached on the fifth day.

The following figure shows the growth curve:



25. In enzyme replacement therapy, the patient is given functional ADA (Adenosine Deaminase) by injection.

Hereditary disease can be corrected by gene therapy. It is a collection of methods that allows correction or replacement of defective genes. The first gene therapy was given in 1990 to a 4 years old girl with Adenosine Deaminase (ADA) deficiency. It is caused due to the deletion of gene for adenosine deaminase.

Disadvantages

i. The patient does not completely recover from the disease.

ii. It needs periodic injections of the enzyme to the patients.

26. (1) Ecosystem provides direct economic benefits to humans in the form of food like cereals, pulses, nuts and fruits. We also get many other products of commercial importance such as timber, fibres, firewood, construction material, industrial products like tannins, lubricants, dyes, resins, perfumes and products of medicinal importance.

(2) Forests act as 'carbon sink' and producers of huge amount of oxygen. The fast dwindling Amazon forest is producing 20 percent of the total oxygen, without which we cannot live for a moment. Thus forest ecosystem plays a crucial role in maintaining carbon-oxygen balance in nature. This keeps check on pollution and global warming.

OR

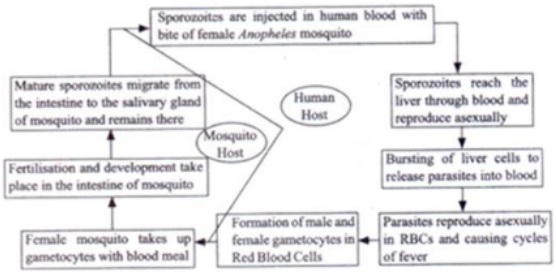
a. • Five extinctions have already occurred

- Sixth is in progress

b.
- Sixth extinction is much faster / sixth extinction is 100 to 1000 times faster
- Human activities like industrialisation, loss of habitat, over exploitation, land reforms.

27. Paleontological evidence is the evidence obtained with the help of fossils. Different- aged rock sediments contain fossil from different life- forms who probably died during the formation of the particular sediment. Studying fossils in different sedimentary layers indicates the geological period in which they existed thus enabling the geologists to reconstruct the geological period and the course of evolutionary change. Hence, paleontological evidence helps us to learn a lot about the evolution of different life forms.

28.



Schematic representation of the malarial parasite life cycle.

Section D

29. i. The hormone is Oxytocin. The signal originates from the placenta and fully developed fetus which initiate the foetal ejection reflex triggering the release of the hormone, oxytocin.

ii. After implantation, finger-like projections appear on the trophoblast called chorionic villi. They are surrounded by uterine tissue and maternal blood.

iii. Under the impact of progesterone and estrogen the size of the uterus and birth canal increases. Relaxation of pelvic ligament takes place. The placenta is developed between chorionic and uterine tissues.

OR

Fully developed foetus pushes down the birth canal, causing stretching of the cervix. This generates nerve impulse which stimulates the hypothalamus. It in turn causes the posterior pituitary to release oxytocin (birth hormone). Oxytocin causes the uterine muscles to contract more vigorously which leads to parturition.

30. i. 1. Viral DNA is produced by reverse transcription.
2. New viral RNA is produced by the infected cell.

ii. HIV has RNA genome; it produces DNA by reverse transcription.

iii. Infected cell can survive and by releasing alpha-interferon.

OR

Due to HIV infection immune system gets suppressed as decrease in T-lymphocytes occurs.

Section E

31. Advantages of cross-pollination :

i. Cross-pollination brings about genetic recombinations and introduces the variations in the offsprings. Some of these variations are more useful and help the individuals in the struggle for existence and adapt to the changing environment.

ii. Plants are diseases resistant.

iii. New and improved varieties of plants can be produced by artificial cross-pollination.

iv. The yield is quite high and never falls below an average minimum.

v. The seeds are much better, usually larger, healthy and more vigorous due to the phenomenon of hybrid vigour.

Disadvantages of cross-pollination :

i. Cross-pollination is not a sure method as the chance factor is always there.

ii. It is a less economical and highly wasteful method as plants have to spend a large amount of energy to produce a large number of pollen grains, develop many devices to promote and effect this kind of pollination by various pollinating agencies.

iii. Harmful or undesirable characters may be introduced in the individuals and may persist in the race permanently.

iv. The very good characters of the race are likely to be lost in the next generation.

OR

i. The minimum number of ovules would be 300 as 300 viable seeds are formed.

ii. 300 megaspore mother cells were involved.

iii. The minimum number of pollen grains that must have been involved is 300.

iv. The number of male gametes involved in seed formation is 300 while the seeds involved in endosperm formation are 300.

32. i. Y stands for yeast in the word YAC (Yeast Artificial Chromosome) and B stands for bacteria in the word BAC (Bacterial Artificial Chromosome). These are used as vectors in the cloning of DNA.

ii. Less than 2% of the total human genome codes for protein, functions of 50 % of discovered genes are not known.

iii. SNPs stands for single nucleotide polymorphisms.

OR

i. X is a repressor protein when an inducer (lactose) combines with it, it is inactivated.

ii. Z gene codes for β- galactosidase

iii. The transcription of this gene would stop when repressor protein binds to the operator gene thus preventing RNA polymerase from transcribing operon in the absence of an inducer.

33. i. **Restriction endonucleases** -These are the bacterial enzymes that cut dsDNA into fragments after recognising and binding to the specific nucleotide sequences, known as recognition site. These enzymes are used to form recombinant molecules of DNA, composed of DNA from different sources.

ii. **Gel-electrophoresis** is the technique which allows the separation and visualisation of fragments of DNA on an agarose gel matrix.
Since the DNA fragments are negatively-charged molecules, they separate and move towards the anode (+ve) under the influence of an electric field. DNA fragments are separated on the basis of their size through the sieving effect provided by the gel.

iii. **Selectable markers in pBR322** help in identification and selection of transformants. pBR322, an E coll cloning vector has two antibiotic resistance genes, i.e. for ampicillin and tetracycline, which act as a selectable marker. When a foreign DNA is ligated at the site of tetracycline resistance (tet^R) gene in pBR322, the recombinant plasmid will lose tetracycline resistance due to insertional inactivation of foreign DNA, but can still be selected out from non-recombinants by placing the transformants on ampicillin containing a medium. The transformants growing on ampicillin containing medium are then transferred on tetracycline containing a medium. The recombinants will grow on ampicillin containing medium but not on tetracycline one whereas non-recombinants grow on both.

OR

a. Polymerase chain reaction or PCR consists of the following three steps:
Denaturation- The two DNA strands of template DNA separate from each other when heated to 92℃.
Annealing- The primers anneal to the 3’ end of single strands of DNA.
Extension- The primers are extended by DNA polymerase by the addition of nucleotides to form complete strands of DNA.
DNA polymerases are enzymes responsible for assembling nucleotides to create new DNA molecules. During DNA replication, the polymerase reads the existing DNA strands and semi-conservatively creates new complementary DNA strands.

b. Application of PCR in the field of:

i. Biotechnology
Multiple copies of the gene of interest can be made through In vitro process
gene amplification

ii. Diagnostics
Early detection of disease at a time when the symptoms are not yet visible
can detect mutations in genes in suspected cancer patients
a powerful technique to identify many other genetic disorders