

Class-XII Session 2022-23
Subject - Biology (044)
Sample Question Paper - 16
With Solution

BLUE PRINT

Ch. No.	Title	Marks Per Unit	Section-A (1 marks)	Section-B (2 marks)	Section-C (3 marks)	Section-D (4 marks)	Section-E (5 marks)	Total Marks
			MCQ & A/R Ques. No.	VSA Ques. No.	SA Ques. No.	Case based Ques. No.	LA Ques. No.	
1	Reproduction in organisms	16	2(Q4, 6)					2
2	Sexual Reproduction in Flowering Plants				1(Q28)		1(Q33)	8
3	Human Reproduction				1(Q22)			3
4	Reproductive Health		1(Q5)	1(Q21)				3
5	Principles of Inheritance and Variation	20	2(Q7, 12)		1(Q23)			5
6	Molecular Basis of Inheritance		1(Q13)			1(Q29)	1(Q31)	10
7	Evolution		2(Q14, 16)		1(Q27)			5
8	Human Health and Disease		1(Q2)		1(Q24)			4
9	Strategies for enhancement in food production	12	1(Q1)					1
10	Microbes in Human Welfare	12	1(Q3)	1(Q18)		1(Q30)		7
11	Biotechnology-Principles and Processes		3(Q8, 9, 15)	1(Q20)				5
12	Biotechnology and its Application		2(Q10, 11)	1(Q17)	1(Q25)			7
13	Organisms and Populations				1(Q26)		1(Q32)	8
14	Ecosystem	10						0
15	Biodiversity and conservation			1(Q19)				2
16	Environmental issues							0
	Total Marks (Total Questions)			16(16)	10(5)	21(7)	8(2)	15(3)

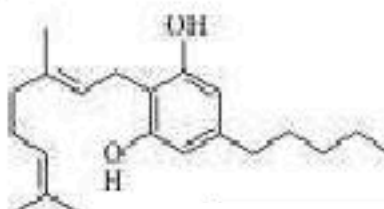
NOTE: The number given inside the bracket denotes question number, ask in the sample paper, while the number given outside the bracket are the number of questions from that particular chapter.

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.

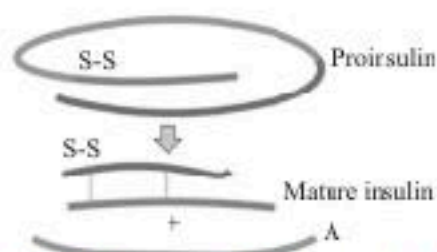
SECTION-A

1. India and China have more than 70% of world livestock population and produce the following percentage of world farm.
(a) 10% (b) 25% (c) 40% (d) 50%
2. Identify the given diagram and its effect?



- (a) Cannabinoid - Effects cardiovascular function
 - (b) Morphine - CNS depressant
 - (c) Cocaine - Euphoria
 - (d) Smack - Psychedelic effect
3. Which bacterium helps in the production of 'Swiss cheese'?
- (a) *Propionibacterium sharmanii*
 - (b) *Trichoderma polysporum*
 - (c) *Saccharomyces cerevisiae*
 - (d) *Aspergillus niger*
4. A feature of reproduction that is common to *Amoeba*, *Spirogyra* and yeast is that
- (a) they reproduce asexually.
 - (b) they are all unicellular.
 - (c) they reproduce only sexually.
 - (d) they are all multicellular.
5. Copper-T acts by
- (a) Suppression of fertilization by forming a membrane
 - (b) Disturbing the site of implantation of blastocyst
 - (c) Acting as a barrier
 - (d) None of these
6. The site of origin of the new plantlets in potato, dahlia, ginger and banana is
- (a) floral buds present on stem.
 - (b) internodes of modified stem.
 - (c) nodes of modified stem.
 - (d) adventitious buds present on root.
7. A pure tall pea was crossed with a pure dwarf pea. All the plants of F_1 were found to be tall. This is due to
- (a) law of dominance.
 - (b) disappearance of factor for dwarfness in F_1 generation.
 - (c) segregation of factors.
 - (d) co-ordination.
8. Which one of the following palindromic base sequences in DNA can be easily cut at about the middle by some particular restriction enzyme?
- (a) 5'.....CGTTCG.....3'
3'.....ATGGTA.....5'
 - (b) 5'.....GATATG.....3'
3'.....CTACTA.....5'
 - (c) 5'.....GAATTC.....3'
3'.....CTTAAG.....5'
 - (d) 5'.....CACGTA.....3'
3'.....CTCAGT.....5'
9. During heat shock to the bacterium, the temperature used for giving thermal shock is
- (a) 82°C
 - (b) 100°C
 - (c) -196°C
 - (d) 42°C

10. Identify the product A in the given figure.



- (a) Polypeptide chain A (b) Polypeptide chain B (c) Polypeptide chain C (d) None of these
11. Main objective of production/use of herbicide resistant GM crops is to
- (a) eliminate weeds from the field without the use of manual labour.
 (b) eliminate weeds from the field without the use of herbicides.
 (c) encourage eco-friendly herbicides.
 (d) reduce herbicide accumulation in food articles for health safety.
12. The F_2 generation of a cross produced identical phenotypic and genotypic ratio. It is not an expected Mendelian result, and can be attributed to
- (a) independent assortment (b) linkage
 (c) incomplete dominance (d) none of the above

Directions: Q.No. 13–16: Consist of two statements–Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true and R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is False but R is true.
13. **Assertion:** N15 is a radioactive isotope of nitrogen and it cannot be separated from N14 only based on densities.
Reason: Taylor and colleagues performed experiment on vicia faba to prove that DNA replication is semi-conservative.
14. **Assertion:** The primitive atmosphere was reducing one i.e., without oxygen.
Reason: In the primitive atmosphere, oxygen was involved in forming ozone.
15. **Assertion:** Restriction enzymes recognise palindromic sequence.
Reason: Palindromic sequences read the same in both directions of the two strands.
16. **Assertion:** Organic compounds first evolved in earth required for origin of life were protein and nucleic acid.
Reason: All life forms were in water environment only.

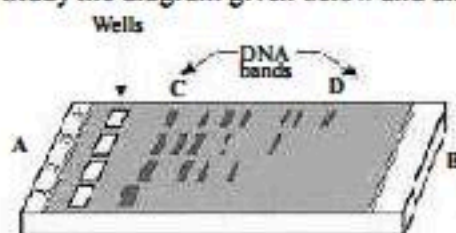
SECTION-B

17. Write the function of adenosine deaminase (ADA) enzyme. State the cause of ADA deficiency in humans. Mention a possible permanent cure for a ADA deficient patient.
18. (a) Why should biological control of pests and pathogens be preferred to the conventional use of chemical pesticides?
 (b) Explain how the following microbes act as biocontrol agents.
 (i) *Bacillus thuringiensis* (ii) Nucleopolyhedrovirus
19. What is RED List prepared by what are its components?

OR

White Bengal tigers are protected in special settings in zoological parks. Tiger reserves are maintained in Western Ghats.

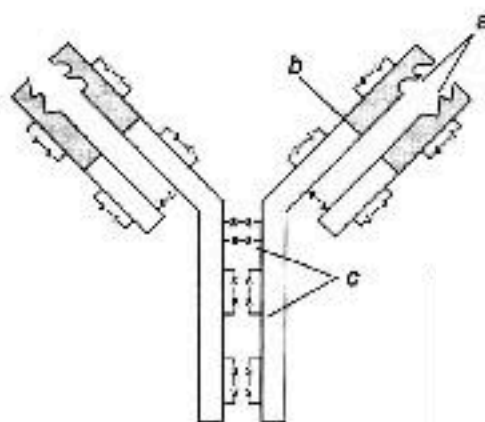
- (a) How do these two approaches differ from each other? Mention the advantages of each one.
 (b) What is the significance of cryopreservation technique?
20. Study the diagram given below and answer the following questions.



- (a) Name the technique shown in the above diagram.
 (b) Why have DNA fragments in band D moved farther away in comparison to those in band C?
 (c) Identify the anode end in the diagram.
 (d) Can these separated DNA bands be used for any purpose? If yes, how and for what purpose?
21. Describe the mechanical methods of birth control.

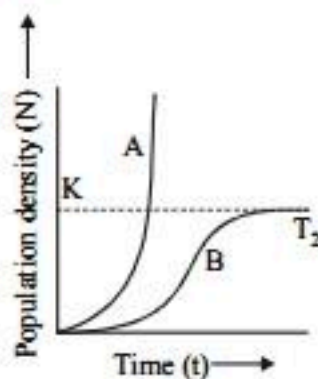
SECTION-C

22. Which hormone stimulates the development of the endometrium ?
23. A woman with 'B' blood group married a man with 'A' blood group. They had two sons and both have 'O' group. List the alleles involved in determining the blood group. Show the possibility of such an inheritance with help of a cross.
- 24.



Identify 'a', 'b' and 'c' in the schematic diagram of an antibody given above and answer the questions.

- (i) Write the chemical nature of an antibody.
- (ii) Name the cells that produce antibodies in humans.
- (iii) Mention the type of immune response provided by an antibody.
25. Explain how transgenic animals have proved to be beneficial in:
 - (a) Study of disease
 - (b) Chemical safety testing
26. Study the population growth curve in the graph given on the right and answer the following questions.



- (a) Identify the growth curves A and B.
- (b) Which one of them is considered a more realistic one and why?
- (c) If $\frac{dN}{dt} = rN \left(\frac{K - N}{K} \right)$ is the equation of the logistic growth curve, what does K stand for?
- (d) What is symbolised by N?
27. (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
28. Draw a labelled diagram of a male gametophytes of an angiosperm. Why does it possess two male gametes in fertilize on ovule?

SECTION-D

29. Read the following and answer any four questions from 29(i) to 29(iv) given below:

Lac Operon

The lac operon consists of one regulatory gene (the *i* gene - here the term *i* does not refer to inducer, rather it is derived from the word inhibitor) and three structural genes (*z*, *y*, and *a*). The *i* gene codes for the repressor of the lac operon. The *z* gene codes for beta-galactosidase (β -gal), which is primarily responsible for the hydrolysis of the disaccharide, lactose into its monomeric units, galactose and glucose. The *y* gene codes for permease, which increases permeability of the cell to β -galactosides. The *a* gene encodes a transacetylase. Hence, all the three gene products in lac operon are required for metabolism of lactose. In most other operons as well, the genes present in the operon are needed together to function in the same or related metabolic pathway. Lactose is the substrate for the enzyme beta-galactosidase and it regulates switching on and off of the operon. Hence, it is termed as inducer. In the absence of a preferred carbon source such as glucose, if lactose is provided in the growth medium of the bacteria, the lactose is transported into the cells through the action of permease. The lactose then induces the operon in the following manner. The repressor of the operon is synthesised (all-the-time - constitutively) from the *i* gene. The repressor protein binds to the operator region of the operon and prevents RNA polymerase from transcribing the operon. In the presence of an inducer, such as lactose or allolactose, the repressor is inactivated by interaction with the inducer. This allows RNA polymerase access to the promoter and transcription proceeds. Regulation of lac operon by repressor is referred to as negative regulation. Lac operon is under control of positive regulation as well.

- (i) Which enzyme produced in a cell in which there is a nonsense mutation in the lac *y* gene?
- (ii) In the presence of lactose, how long does it take for the lac operon to be expressed?
- (iii) When will be lac operon turned on?
- (iv) Which gene is the product of lac *a*?

30. Read the following and answer any four questions from 30(i) to 30(iv) given below:

Microbes in Household Products

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. During growth, the LAB produce acids that coagulate and partially digest the milk proteins. A small amount of curd added to the fresh milk as inoculum or starter contain millions of LAB, which at suitable temperatures multiply, thus converting milk to curd, which also improves its nutritional quality by increasing vitamin B₁₂. In our stomach too, the LAB play very beneficial role in checking disease causing microbes. The dough, which is used for making foods such as dosa and idli is also fermented by bacteria. The puffed-up appearance of dough is due to the production of CO₂ gas. the dough, which is used for making bread, is fermented using baker's yeast (*Saccharomyces cerevisiae*). 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. Microbes are also used to ferment fish, soyabean and bamboo shoots to make foods. Cheese, is one of the oldest food items in which microbes were used. Different varieties of cheese are known by their characteristic texture, flavour and taste, the specificity coming from the microbes used. For example, the large holes in 'Swiss cheese' are due to production of a large amount of CO₂ by a bacterium named *Propionibacterium sharmanii*. The 'Roquefort cheese' are ripened by growing a specific fungi on them, which gives them a particular flavour.

- (i) Name the bacteria that help to produce large holes in swiss cheese.
- (ii) Which nutritional amount is increases during the conversion of milk to curd?
- (iii) Carbon dioxide is not released in which process?
- (iv) Name the cheese which are ripened by growing a specific fungi?

SECTION-E

31. (a) How are the following formed and involved in DNA packaging in a nucleus of a cell?

- (i) Histone octamer
- (ii) Nucleosome
- (iii) Chromatin

- (b) Differentiate between Euchromatin and Heterochromatin.

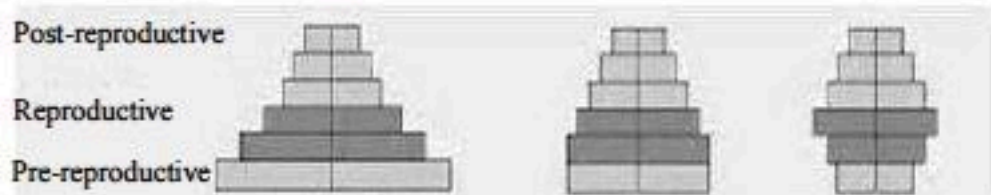
OR

Describe Meselson and Stahl's experiment that was carried in 1958 on *E. Coli*. Write the conclusion they arrived at after the experiment.

32. Discuss conservation of biodiversity with special reference to Earth summit and world summit?

OR

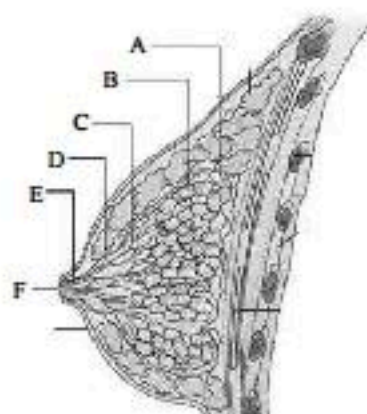
(a) Study the three different age pyramids, for human population given below and answer the questions that follow.



- Write the names given to each of these age pyramids.
 - Mention the one which is ideal for human population and why?
- (b) How does an age pyramid for human population at given point of time helps the policy-makers in planning for future?
33. (a) Draw a diagrammatic sectional view of a mature anatropous ovule and label the following parts in it.
- that develops into seed coat.
 - that develops into an embryo after fertilisation.
 - that develops into an endosperm in an albuminous seed.
 - through which the pollen tube gains entry into the embryo sac.
 - that attaches the ovule to the placenta.
- (b) Describe the characteristic features of wind-pollinated flowers.

OR

Observe the diagram showing sectional view of mammary gland and answer the following questions:



- Which part of the mammary gland produces milk?
- Name the process through which milk is produced towards the end of pregnancy.
- Trace the path of milk from its site of production up to the part labelled as 'F' in the above diagram.
- Why is breastfeeding recommended during the initial stages of infant growth?

Solutions

SAMPLE PAPER-5

1. (b) It is estimated that more than 70 percent of the world livestock population is in India and China. However, the contribution to the world farm produce is only 25 percent i.e. the productivity per unit is very low. (1 mark)
2. (a) (1 mark)
3. (a) Large holes in 'Swiss cheese' are due to production of CO₂ by *Propionibacterium sharmanii* (a bacterium). (1 mark)
4. (a) Common feature of reproduction among Amoeba, Spirogyra and yeast is that they all reproduce asexually. Asexual reproduction is common among single celled organisms and in plants and animals with relatively simple organization. (1 mark)
5. (b) (1 mark)
6. (c) (1 mark)
7. (a) According to law of dominance, only one character or factor expresses itself in F₁ generation and this character is called dominant. Therefore in this cross, character of tallness, which is observed in all the plants of F₁ generation, is the dominant character. (1 mark)
8. (c) Palindromic sequences in DNA molecule are group of bases that forms the same sequence when read in both forward and backward direction. In the given question, only option (c) represent a palindromic sequence. (1 mark)
9. (d) (1 mark)
10. (c) (1 mark)
11. (d) Main objective of production/use of herbicide resistant GM crops is to reduce herbicide accumulation in food articles for health safety. GM plants have been useful in many ways. Genetic modifications has made crops more tolerant to abiotic stresses, reduced reliance on chemical pesticides and enhanced nutritional value of food. (1 mark)
12. (c) Incomplete dominance is the phenomenon where dominant allele does not completely express itself. This phenomenon was first studied in flower colour of *Mirabilis jalapa* or four O' clock plant. The phenotypic as well as genotypic monohybrid ratio in F₂ generation in incomplete dominance is 1 : 2 : 1 i.e., pure dominant : hybrid : pure recessive. F₁ generation expresses a phenotype which is intermediate between those of the parent, e.g., pink flowers are obtained when red and white flowered plants are crossed. (1 mark)
13. (c) N¹⁵ is not a radioactive isotope of nitrogen and it can be separated from N¹⁴ only based on densities. N¹⁵ is a heavy isotope of nitrogen. Matthew Meselson and Franklin Stahl performed experiments on *E. coli*. (1 mark)
14. (c) The lightest atoms of nitrogen, carbon, etc. formed the primitive atmosphere. Hydrogen atoms were most numerous and most reactive in primitive atmosphere. Hydrogen atoms combined with all oxygen atoms to form water leaving no free oxygen. Thus, primitive atmosphere was reducing (without free oxygen) unlike the present oxidising atmosphere (with free oxygen). Formation of ozone layer is the consequence of modern oxidising atmosphere having plenty of free oxygen. As more oxygen accumulated in the atmosphere (due to photosynthesis), ozone began to appear in the top layers. (1 mark)
15. (b) The palindrome in DNA is a sequence of base pairs that reads the same on the two strands when orientation of reading is kept the same. Restriction enzymes cut the strand of DNA a little away from the centre of the palindrome sites, but between the same two bases on opposite strands. (1 mark)
16. (b) Organic compounds that first evolved in earth which required for origin of life were protein and nucleic acid. All life forms were in aquatic environment only. (1 mark)
17.
 - The enzyme adenosine deaminase (ADA) is important for the proper functioning of our immune system.
 - The ADA deficiency in humans is caused by the deletion of the gene which codes for ADA enzyme.
 - ADA deficiency can be cured permanently by gene therapy in which a functional ADA gene is inserted in the cells at an early embryonic stage. This normal copy of gene takes over the function of the non-functional gene and produces normal ADA enzyme. (2 marks)
18. (a) Biological control of pests and pathogens is preferred because the chemicals cause pollution of water bodies as well as ground water, besides getting stored in the plants. Also, these chemicals are toxic thus, extremely harmful to human beings and other animals.
- (b) Following microbes are used as biocontrol agents as given:
 - (i) *Bacillus thuringiensis* are available in sachets as dried spores, that are mixed with water and sprayed on to vulnerable plants. When they are eaten by the insect larvae, the toxin is released in the gut and the larvae get killed. With the development of genetic engineering, *Bt* toxin genes have been introduced into crop plants, that makes them resistant to insect pests.
 - (ii) Nucleopolyhedrovirus are pathogens that attack insects and other arthropods. These are used as biocontrol agents. These are excellent candidates for species specific, narrow spectrum insecticidal applications. This is especially desirable when beneficial insects are being conserved to aid in an overall Integrated Pest Management (IPM) programme. (1 + 2 × ½ marks)
19. Red list made by IUCN is a directory of organisms that are facing extinction and it can be used for conservation programme.
Its comprises are the following.
 1. Extinct
 2. Extinct in wild.
 3. Critically endangered
 4. Endangered
 5. Vulnerable
 6. Lower Risk
 7. Data deficient to → be made
 8. Not evaluated to → be done (2 marks)

OR

White Bengal tigers are protected in special settings in zoological parks. This is called *ex situ* conservation. Tiger reserves are maintained in Western Ghats. This is called *in situ* conservation.

(a) Differences between *in situ* conservation and *ex situ* conservation and their advantages are as follows :

S.No.	<i>In situ</i> Conservation	<i>Ex situ</i> Conservation
1	Difference: It is the conservation and protection of biodiversity in natural habitat.	It is the conservation of selected threatened plant and animal species in places outside their natural habitat.
2	Advantage: Population is conserved in surroundings, where they have developed their distinctive features.	Population is conserved under stimulated conditions that closely resemble their natural habitats.

(b) Significance of cryopreservation techniques is as follows :

- Gametes of threatened species and seeds of different genetic strains of commercially important plants can be preserved in viable and fertile condition for long.
- Threatened plant species can be propagated by tissue culture method.
- Eggs of these species can be fertilised *in vitro*.

(1+1 marks)

20. (a) Gel electrophoresis
 (b) DNA fragments in band D are smaller in size than DNA fragments in band C. Therefore, they moved faster and farther.
 (c) Anode end in the diagram is marked as B.
 (d) Yes, these separated DNA bands can be eluted *i.e.*, cut out from the agarose gel and extracted from the gel piece. These eluted DNA fragments are joined with cloning vectors to make recombinant DNA.
 (4 × ½ marks)

21. Following are the mechanical methods of birth control:

- Condoms : These are barriers made of thin rubber/latex sheath that are used to cover the penis in the male or vagina and cervix in the female, just before coitus so that the ejaculated semen would not enter into the female reproductive tract. Nirodh is a popular brand of condom for the male. It is mostly widely used contraceptive by male in India as it is cheap and easily available.
- Diaphragms, cervical caps and vaults : These are also barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. They prevent conception by blocking the entry of sperms through cervix. They are reusable.
- Intra uterine devices (IUDs) : These include non-medicated IUDs (e.g., Lippes loop), copper releasing IUDs (CuT, Cu7, Multiload 375) and the hormone releasing IUDs (progestasert LNG-20). These devices are inserted by doctors or expert nurses in the uterus through vagina. IUDs increase phagocytosis of sperms within the uterus and the Cu ions released suppress sperm motility and the fertilising capacity of sperms.

(2 marks)

22. Estrogen and progesterone stimulate the development of the endometrium and preparation of the uterine inner lining for implantation of a zygote. The endometrium undergo cyclical changes during menstrual cycle while the myometrium exhibits strong contraction during delivery of the baby.
 (3 marks)

23. • The gene controlling blood group is I with three alleles – I^A , I^B and i . Alleles I^A and I^B are codominant and ' i ' is recessive.

• The inheritance of blood group in the given case can be explained as below:

Parents: Blood group A (Man) × Blood group B (Woman)
 ↓
 Progeny: Blood group O (Son)

Since they have sons with blood group 'O', parents must be heterozygous. So,

Parents: $I^A i$ (Man) × $I^B i$ (Woman)
 Gametes: I^A i I^B i

Progeny:

♂ \ ♀	I^A	i
I^B	$I^A I^B$ AB blood group	$I^B i$ B blood group
i	$I^A i$ A blood group	ii O blood group

The progeny of woman with B blood group and man with A blood group can have all the four blood groups, *i.e.*, A, B, AB and O.
 (3 marks)

24. a - Antigen binding site b - Light chain
 c - Heavy chain
 (i) Antibodies are proteins (ii) B-lymphocytes
 (iii) Humoral immune response. (1+1+1 marks)
25. (a) Study of disease: Many transgenic animals are designed to increase our understanding of how genes contribute to the development of disease. Today transgenic models exist for many diseases such as cancer, cystic fibrosis, rheumatoid arthritis and Alzheimer's so that investigation of new treatments for diseases is made possible.

- (b) Chemical safety testing : This is known as toxicity/ safety testing. Transgenic animals are made that carry genes which make them more sensitive to toxic substances than non-transgenic animals. They are then exposed to the toxic substances and the effects studied. (1½ + 1½ marks)

26. (a) A – Exponential growth curve
B – Logistic growth curve
(b) Logistic growth curve (B) is considered more realistic one because the resources are finite and become limited sooner or later.
(c) K stands for carrying capacity *i.e.*, the maximum number of individuals of a population, that the given environment can sustain at a given time.
(d) N symbolises population density, *i.e.*, the number of individuals in a given population per unit area. (½ + 1 + 1 + ½ marks)

27. (a)

Homologous organs	Analogous organs
Similar in origin and basic structure but may differ in function.	Dissimilar in origin and basic structure but may have similar function.
Provide idea of common ancestry.	Do not provide the idea of common ancestry.
For E.g. hands of human beings and forelimbs of horse.	For E.g. wing of birds and insects.

- (b) These are the analogous structure from the given list:
(i) Wings of butterfly and birds.
(ii) Tubers of sweet potato and potato. (2 + 1 marks)

(iii) **Chromatin:** It is a complex of DNA and proteins. Its main function is to efficiently package the DNA into the nucleus.

Euchromatin	Heterchromatin
(i) It is a loosely packed region of chromatin.	(i) It is a densely packed region of DNA.
(ii) It stains light.	(ii) It stains dark.
(iii) It is transcriptionally active.	(iii) It is transcriptionally inactive.

(3 + 2 marks)

OR

Experiment

The experiment was performed by Meselson and Stahl. The following steps were followed in the experiment:

E. coli was grown in a medium containing the heavy isotope ¹⁵N as the sole nitrogen source. This led to the incorporation of ¹⁵N into the newly synthesised DNA, which ultimately made the DNA heavy. (1 mark)

This heavy DNA was separated from the normal DNA by density gradient centrifugation using cesium chloride as the gradient.

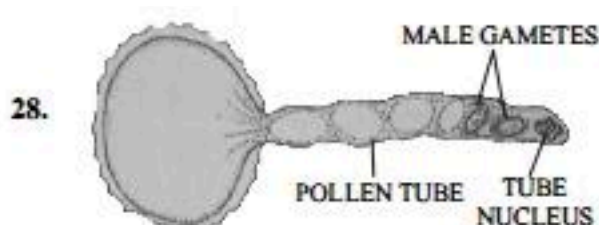


Fig: A male gametophyte

The male gametophyte possesses two male gametes out of which one of the male gametes fuses with the egg resulting in the production of zygote (2N) while the second male gamete fuses with two polar nuclei or secondary diploid nucleus (2N) to form triploid primary endosperm nucleus (3N). This phenomenon involving two fusions, is called Double fertilisation. (1 + 2 marks)

29. (i) Lactose permease.
(ii) The lac operon to be expressed as long as lactose is more than glucose concentration.
(iii) When lactose concentration is more than glucose it will be turn on.
(iv) Transacetylase. (1 + 1 + 1 + 1 marks)
30. (i) *Propionibacterium sharmanii*
(ii) Vitamin B₁₂
(iii) Lactate fermentation
(iv) Roquefort cheese (1 + 1 + 1 + 1 marks)
31. (a)
(i) **Histone octamer:** It is a unit consisting of eight molecules of histone proteins (two molecules each of H₂A, H₂B, H₃ and H₄ histones). It interacts with the DNA to keep it associated with itself.
(ii) **Nucleosome:** DNA (negatively charged) winds around the histone octamer (positively charged) to form a nucleosome, which acts as a building block for packaging the DNA into chromatin. (1 mark)

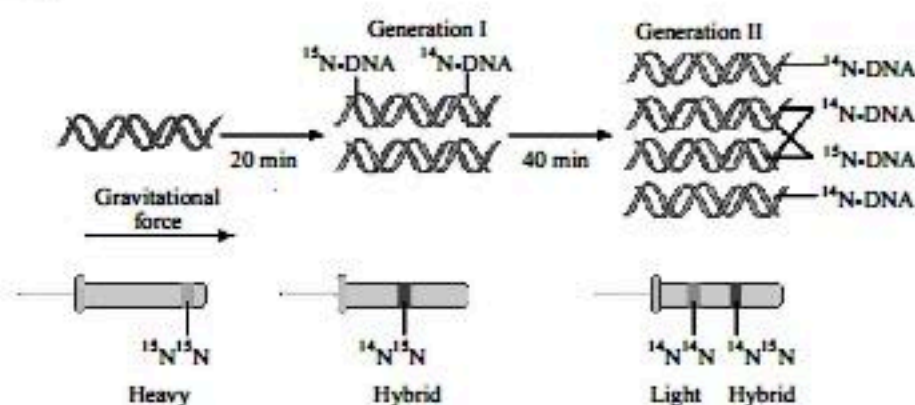
The cells were then transferred into a medium with ¹⁴N as the nitrogen source. Samples were taken from this medium and the DNA was extracted.

Observation

Since *E. coli* divides every 20 minutes, the DNA extracted after 20 minutes in the experiment had a hybrid density. The DNA extracted after 40 minutes had equal amounts of hybrid and light densities.

Conclusion

This implies that the newly synthesised DNA obtained one of its strands from the parent. Thus, replication was semi-conservative.



(5 marks)

32. **The Earth Summit.** This is the historic convention on biological diversity held in Rio de Janeiro in 1992. It called upon all the nations to take appropriate measures for:

- conservation of biodiversity
- sustainable utilization of the benefits from biodiversity.
- Fair and equitable sharing of benefits arising out of the utilization of genetic resources.

The World Summit on Sustainable Development was held in 2002, in Johannesburg, South Africa. 190 countries signed commitment to achieve a significant reduction in the current rate of biodiversity loss at global, regional and local levels by 2010.

(5 marks)

OR

- A – Expanding, B – Stable, C – Declining
 - Stable population is preferred. It is beneficial for survival and better living of the human population.
- The structure of the age pyramid determines the growth status of the population, that is, whether it is growing, stable or declining. On the basis of the collective information, the policies for the population can be decided. These may emphasise on providing food to the population, development of proper health services, planning more schools, technical institutes for education, help elderly people live comfortably, and more job opportunities for future. (2 + 3 marks)

33. (a)

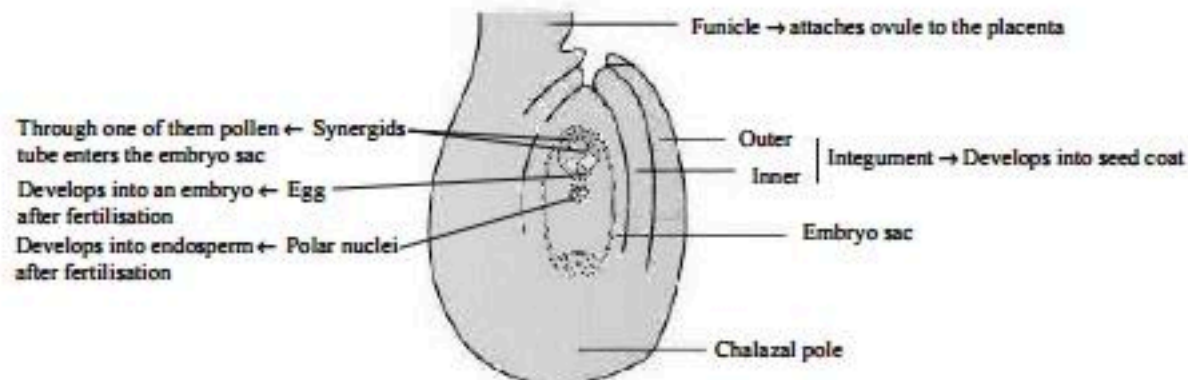


Fig.: Anatropous ovule

(b) Characteristics of wind-pollinated flowers are:

- Flowers are small, colourless, nectarless and many which are arranged into an inflorescence.
- Pollen grains are light and non-sticky.
- Anthers are well exposed for the easy dispersal of pollen grains.
- Large and feathery stigma to trap air-borne pollen grains.

(6 × 1/2 + 2 marks)

OR

- Part labelled as 'B' or mammary alveolus secretes milk.
- Lactation is the process through which milk is produced towards the end of pregnancy.

(c) The path followed by the milk from its site of production is:

Cells of alveoli (secrete milk) → Mammary tubules → Mammary ducts → Mammary ampulla → Lactiferous duct (through which milk is sucked through structure 'F' or nipple)

- The milk produced during the initial few days of lactation, called colostrum, contains several antibodies absolutely essential to develop resistance for the new-born babies. Hence, breastfeeding during period of infant growth is important for bringing up a healthy baby. (1 + 1 + 1 + 2 marks)