OSDAV Public School, Kaithal

Half yearly Exams (2024-25)

Class : XII SET-A

Subject : Biology

Time: 3 Hrs . M.M. : 70

General Instructions:-

(i)All questions are compulsory.

(ii)The question paper has five sections and 33 questions. All questions are compulsory.

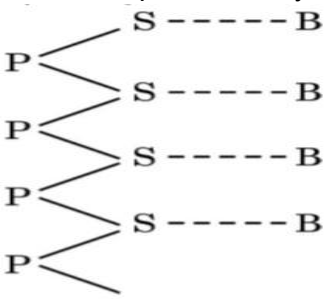
(iii)Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.

(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 labelled diagrams should be drawn.

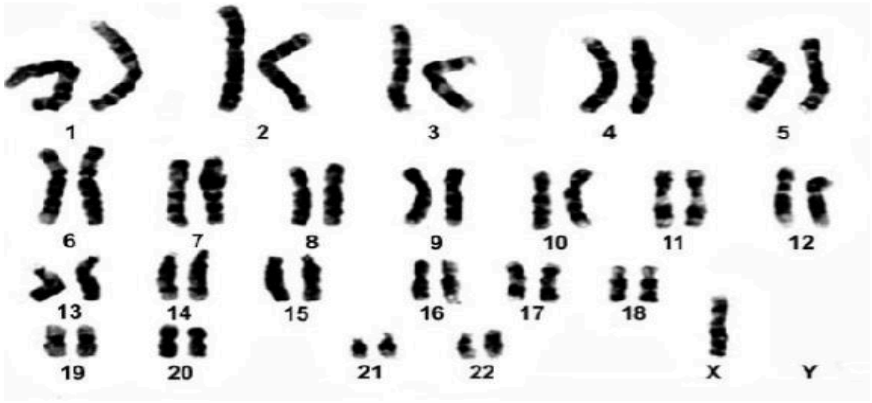
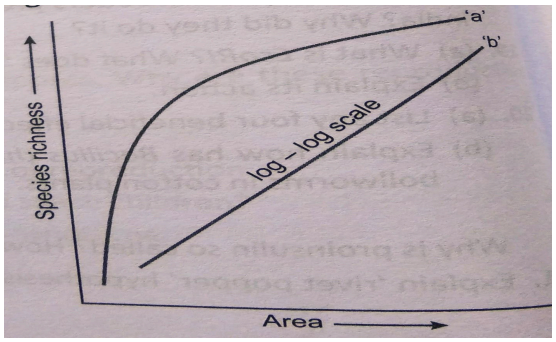
SECTION- A

Q 1	Examples that show commensalism are : (i) An orchid growing on mango tree (ii) Cuckoo bird and crow (iii) Cuscuta growing on Nerium tree (iv) Barnacles growing on whale (a) (i) and (ii) (b) (i) and (iv) (c) (ii) and (iii) (d) (ii) and (iv)	**1**
Q.2	Match the items in Column I with those in Column II and select the correctly matched option from those given below : **Column I Cross** **Column II Phenotypic Ratio** 1. Mendelian monohybrid (i) 1 : 2 : 1 (F2) 2. Mendelian dihybrid (ii) 1 : 1 3. Incomplete dominance (iii) 3 : 1 (F2) 4. Test cross (monohybrid) (iv) 9 : 3 : 3 : 1 (F2) Options : (A) 1 (ii), 2 (iv), 3 (i), 4 (iii) (B) 1 (iii), 2 (i), 3 (iv), 4 (ii) (C) 1 (iii), 2 (iv), 3 (i), 4 (ii) (D) 1 (ii), 2 (i), 3 (iv), 4 (iii)	**1**
Q.3	Select the incorrect match from the following : **Human Karyotype** **Characters** (A) 45 + XX Broad palm with characteristic palm crease (B) 44 + XXY Overall feminine development (C) 44 + XO Sterile females as ovaries are rudimentary (D) 44 + XY Normal male	**1**
Q.4	Three genes R, S and T are located on the same chromosome. If the recombinant percentage between R and S is 20%, R and T is 35% and S and T is 15% respectively, can you predict the correct order of these genes on the chromosome ? Which of the following shows the correct sequence of the genes on the chromosome ? (a) R T S (b) R S T (c) S R T (d) S T R	**1**
Q.5	In humans, the secondary oocyte completes meiotic division when : (A) it gets implanted in the uterine endometrium. (B) it is released from the mature Graafian follicle. (C) it is penetrated by the sperm cell. (D) acrosomal enzymes break down the zona pellucida.	**1**
Q.6	Homologous organs indicate : (A) Convergent Evolution (B) Divergent Evolution (C) Adaptive Radiation (D) Natural Selection	**1**

Q 7	The periodic abstinence by a couple for family planning should be from : (A) Day 5 to 10 of menstrual cycle (B) Day 13 to 15 of menstrual cycle (C) Day 10 to 17 of menstrual cycle (D) Day 16 to 20 of menstrual cycle	**1**
Q.8	The type of bond represented by the dotted line in a schematic polynucleotide chain is :  (A) Hydrogen bond (B) Peptide bond (C) N-glycosidic linkage (D) Phosphodiester bond	**1**
Q 9	After double fertilisation, a mature ovule has (a)1 diploid and 1 haploid cell (b) 1 diploid and 1 triploid cell (c)2 haploid and 1 triploid cell (d) 1 haploid and 1 triploid cell	**1**
Q.10	You know that there are twenty different types of naturally occurring amino acids and four different types of bases in the DNA. A combination of 3 such bases code for a specific amino acid. If instead there are 96 different amino acids and 12 different bases in the DNA, then the minimum number of combination of bases required to form a codon is : (A) 6 (B) 8 (C) 2 (D) 4	**1**
Q.11	Which of the following is most likely to be true about the percentage of energy received by a horse and a crow from the producers in different food chains? **Horse** **Crow** P always the same always the same Q always the same can be different R can be different always the same S can be different can be different A. P B. Q C. R D. S	**1**
Q.12	The rate of formation of new organic matter by consumers, and the biomass available for consumption of herbivores as well as decomposers are referred to as : (A) Gross primary productivity and Net primary productivity (B) Net primary productivity and Secondary productivity (C) Secondary productivity and Net primary productivity (D) Secondary productivity and Gross primary productivity	**1**
Q.13	**Q.No. 13 to 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** **Assertion** : Apomixis and parthenocarpy are both asexual modes of reproduction. **Reason** : Seeds are not produced in both apomixis and parthenocarpy	**1**
Q 14	**Assertion** : Darwin showed how even a slow growing animal like an elephant could reach enormous numbers. **Reason** : When resources in the habitat are unlimited, each species has the ability to realise its innate potential fully	**1**
Q.15	**Assertion :** Endosperm is completely consumed during development of embryo in exalbuminous seeds. **Reason** : Castor, pea and beans are all examples of ex-albuminous seeds.	**1**

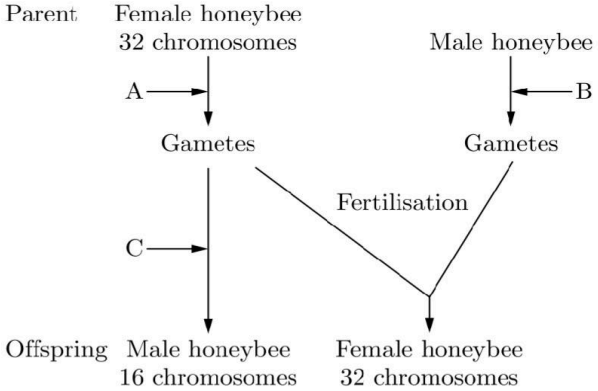
Q 16	**Assertion** : A species of wasp and a fig species cannot complete their life cycle without each other. **Reason** : While visiting wasps come to lay eggs in the fig inflorescence, the flower of wasp gets pollinated in return	**1**

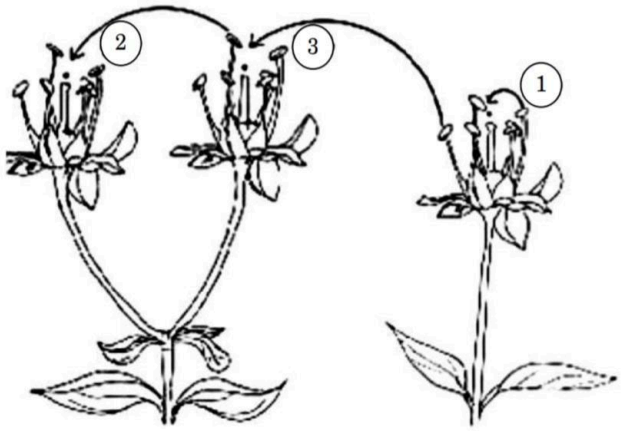
SECTION-B

Q.17	A)Female gametes are transferred to the fallopian tube in the GIFT procedure. Is it possible to transfer the gametes to the uterus? B)Why are non-medicated methods not as effective as the copper ions releasing Intrauterine Devices**?**	**2**
Q 18	Given below is the karyotype of an individual.  (a) What are the characteristic reproductive and physical features of such an individual? (b) What is the category of such disorders called? How is it caused?	**2**
Q.19	Where does oogenesis take place in human females? Give the schematic representation of it.	**2**
Q.20	Identify the type of flowers shown in A and B. Which of the two will produce an assured seed set? 	**2**
Q.21	The following graph shows the species area relationship.Answer the following questions as directed--  A) Name the naturalist Who studied the kind of relationship shown in the graph and write the observations made by him. B) Write the situations as discovered by the Ecologists when the value of Z lies between; a-- 0.1 to 0.2 b--0.6 to 1.2	**2**

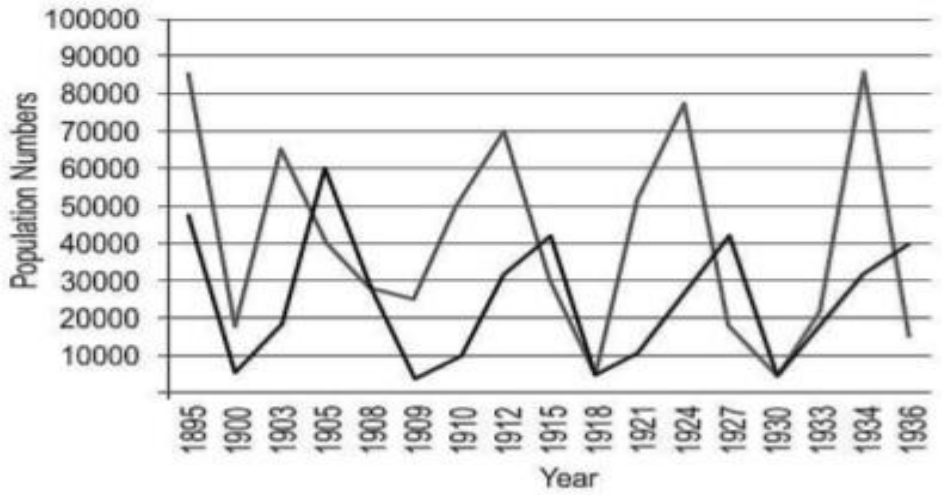
SECTION-C

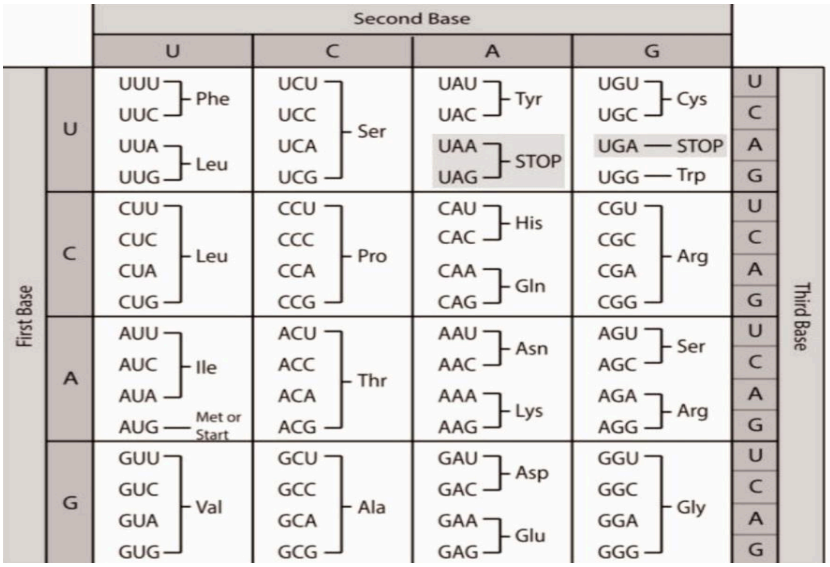
Q.22	Answer the following questions based on Hershey and Chase's experiments	

	(i) Name the kind of virus they worked with and why? (ii) Why did they use two types of culture media to grow viruses in? Explain. (iii) What was the need for using a blender and later a centrifuge during their experiments? (iv) State the conclusion drawn by them after the experiments.	**3**
Q.23	Give reason for the following--- A) Penicillium does not allow the growth of staphylococcus bacteria on a culture plate. B) Sucker fish attaches itself to the under surface of the shark with the help of its dorsal fin. C) Lichens represent an intimate relationship between a fungus and photosynthetic algae.	**3**
Q.24	A)What are the different stages of the follicular phase of the menstrual cycle taking place in the ovary and uterus? B)Why is breastfeeding recommended during the initial stages of infant growth?	**3**
Q.25	a)Which law states that the sum of allelic frequencies in a population is constant? List the two factors that influence the law. b)The figure given below shows white winged and dark winged moths present on a tree trunk with variable lichen growth (a) in unpolluted areas and (b) in polluted areas. Which variety of moth is likely to survive in these two conditions? Justify your answer.  (a) (b)	**3**
Q.26	a)Alien species are highly invasive and a threat to species diversity substantiate this statement with suitable examples from both plants and animal b)The cytological observations made in a number of insects led to the development of the concept of genetic/ chromosomal basis of sex-determination mechanism. Honeybee is an interesting example to study the mechanism of sex-determination. Study the schematic cross between the male and the female honey bees given below and answer the questions that follow  a) Identify the cell divisions 'A' and 'B' that lead to gamete formation in female and male honey bees respectively. (b) Name the process 'C' that leads to the development of male honeybee (drone)	**3**
Q.27	a)How is perisperm different from pericarp? b) Describe the most common method of endosperm development in angiosperms	**3**
Q.28	Study the diagram given below showing the modes of pollination. Answer the questions that follow. (i) The given diagram shows three methods of pollen transfer in plants. What are the technical terms used for pollen transfer ?	

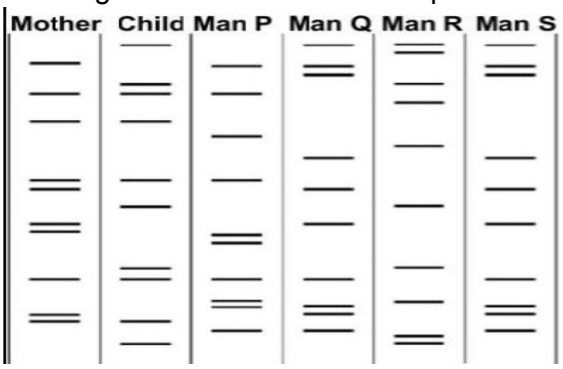
	(ii) Flowering plants have developed many devices to avoid inbreeding depression. Explain one hereditary and one physiological device which helps plants to achieve this target.  	3

SECTION-D

Q.29	**CASE STUDY BASED QUESTIONS** Predator Y shown in the image below is a type of wild cat that inhabits the forests and preys primarily on prey X which are herbivores. Shown below is data on their respective populations over time.  (a) What is the likely cause for the pattern seen in the prey and predator populations through the years? (b) Hypothetically, if all the predators of the forests become extinct, what will happen to the vegetation of the forest? (c) Consider a situation where another similar species of predator immigrated to the forest. What is likely to happen over time and why?	4
Q.30	Given below is a DNA sequence and the genetic code. Answer the questions based on these, assuming no post-transcriptional or post-translational modifications will take place. - TACATGCCGTACTGTACC - (a) Write the nucleotide sequence that will be obtained on transcription of this DNA sequence. (b) Will translation of this sequence take place? Give a reason to support your answer. (c) What is the amino acid sequence that will be formed? Identify the sequence of the first tRNA. (d) If the first guanine base in the DNA sequence gets replaced by thymine, how will the amino acid sequence change? (e) Name and describe the mutation that occurred in (d).	4



SECTION-E

Q.31	The image below shows the DNA profile of four men, a mother and her child  (a) Which man is most probably the father of the child? Give a reason to support your answer. (b) Which technique, commonly used in forensic studies such as paternal testing, is depicted in the image? (c) What is the basic principle that the technique identified in (b) is based on? (d) What is the most likely relationship, if any, between men Q and S? Justify your answer.	**5**
Q.32	Describe the formation of seven celled eight nucleate embryo sac from the Megaspore mother cell with well labelled diagrams.	**5**
Q.33	a) Describe switch on model of lac operon with diagram b) Explain why tRNA is called an adaptor molecule? c) Differentiate between leading and lagging strands of replication fork.	**5**

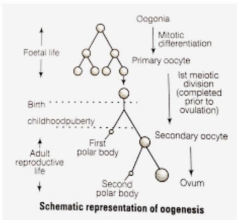
BIOLOGY-- XII Set A

SEPTEMBER EXAMINATION(2024)
ANSWER KEY AND MARKING SCHEME
SECTION A

Q 1	B	**1**
Q 2	C	**1**
Q 3	B	**1**
Q 4	B	**1**
Q.5	C	**1**
Q 6	B	**1**
Q 7	C	**1**
Q 8	C	**1**
Q.9	B	**1**
Q.10	C	**1**
Q.11	B	**1**
Q.12	C	**1**
Q 13	C	**1**
Q.14	A	**1**
Q.15	C	**1**
Q.16	A	**1**

SECTION B

Q.17	A)It is not possible to transfer the gametes to the uterus. This is because the gametes cannot survive in the environment of the uterus. They will be degenerated or phagocytosed if transferred directly into the uterus. B)The non-medicated methods are less effective than the copper ions releasing IUDs because: ● The copper ions reduce the fertilising capacity and the motility of the sperms. ● It phagocytosis the sperms inside the uterus.	**1** **1**
Q.18	a) - sterile females with rudimentary ovaries - short stature and underdeveloped feminine character (b) - category: chromosomal disorders/aneuploidy - cause: failure of segregation of chromatids during cell division cycle	**1** **1**
Q 19	i)Germinal epithelium of ovary ii)Page 49 NCERT chart of oogenesis Or	**½** **½+½+ ½**

	 Schematic representation of oogenesis	
Q 20	The flower A is a chasmogamous flower having exposed anthers and stigma whereas B is a cleistogamous flower which do not open at all. Cleistogamous flowers produce an assured seed set.	½ ½ **1**
Q.21	a)The naturalist who investigated the relationship shown in the graph was Alexander Von Humboldt. He found that species richness increased within a region with an increase in the area explored, but only to a maximum. b)b)When the value of z lies between (i) z = 0.1 to 0.2: for small or average areas. (ii) z = 0.6 to 1.2 : for a large area, for example, the entire continent.	½ **1** ½

SECTION C

Q.22	(i) They worked with bacteriophage, i.e. viruses that infect bacteria. These viruses were used because during infection they transfer their genetic material into bacteria. (ii) They used two types of culture media, containing ^{35}S and ^{32}P, so as to compare which one out of DNA and proteins gets transferred from virus to bacteria and acts as genetic material. (iii) A blender and centrifuge was used to open up the bacterial cells and viral particles, so that genetic material could be exposed. (iv) Conclusion DNA is the genetic material.	½ **1** **1** ½
Q.23	A)The mould Penicillium creates the secretion known as penicillin, which is extremely toxic to staphylococcus bacteria and this interaction is termed as amensalism. B)The suckerfish uses a sucker to attach itself to the shark. It uses sharks for their transportation. It also uses sharks for their food and nutrition which they get from the leftover food of the shark. They do not harm sharks in this process.This interaction is termed as commensalism. C) Symbiosis in lichens is the mutualistic relationship of algae living among filaments of a fungus. The fungus benefits from the algae because they produce food by photosynthesis. The fungus provides water, nutrients and shelter for the algae.	**1** **1** **1**
Q 24	A)In this phase, primary follicles transform into the fully mature Graafian follicle in the ovary. The endometrium of the uterus simultaneously regenerates through proliferation. Changes in the levels of ovarian and pituitary hormones induce changes in the uterus and ovaries. During this stage, the secretion of FSH and LH eventually increases and triggers the secretion and follicular development of estrogen by the growing follicles. In the middle of the cycle, both LH and FSH reach the peak level. This speedy secretion of LH at the maximum level during the mid-cycle causes rupture of Graafian follicle and hence ovulation. B) The mammary glands in females start producing milk towards the end of pregnancy through the process of lactation which helps the mother feed the newborn. Colostrum is the milk produced during the initial few days. Colostrum contains antibodies which are crucial in developing resistance in the newborns, hence it is recommended by doctors to bring up a	2 **1**

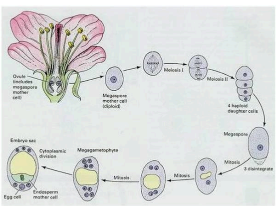
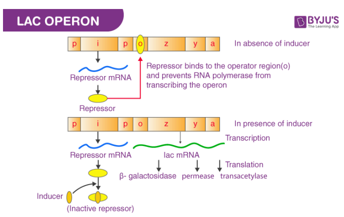
Q 25	a)Hardy Weinberg Principle:. Following five factors influence these values: (a) Gene migration or gene flow (b) Genetic drift (c) Genetic recombination (d) Mutation (e) Natural selection(any two) b)The predators will spot a moth against a contrasting background. In a polluted area, the tree trunks become dark due to industrial smoke and soot. Under this condition the white-winged moth cannot survive due to predators, dark-winged or melanised moth will survive. In a collection of moths in unpolluted area, more white-winged moths on trees would survive than dark-winged or melanised moths. However, in the polluted area, more dark-winged moths would survive i.e., the proportion will be reversed.	**1** **½+½** **1**
Q.26	a)●In animals, Nile perch introduced in to the Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fishes in the lake / Introduction of ●African catfish Clarias gariepinus for aquaculture purposes is posing a threat to indigenous catfishes in our River. ●In plants, introduction of Parthenium Water hyacinth or Lantana threat to native species. b) Meiosis,Mitosis Parthenogenesis	**½** **½** **½** **1** **½**
Q.27	a)Persistent remains of the nucellus in the seed is called perisperm Walls/covering of the fruit which is formed by the walls of the ovaries is termed as pericarp b)The most common type of endosperm development in angiosperms is the nuclear type. In this type of development, the first division of the primary endosperm nucleus and few subsequent nuclear divisions are not accompanied by wall formation. The nuclei produced are free in the cytoplasm of the embryo sac . These nuclei may remain free indefinitely or may form walls later. Coconut is an example .	**1** **2**
Q.28	(i) Autogamy, Geitonogamy, Xenogamy (b)hereditary- unisexuality,heterostyly Physiological- self incompatibility - The pollen of a plant is not allowed to germinate on the stigma of the same flower or on a different flower of the same plant due to pollen-pistil interaction.	**1** **1** **1**

SECTION-D

Q.29	(a) Since prey X is the primary food for prey Y, as the prey population increases, so does the predator population. - More predators consume the prey causing the prey population to drop. - As the prey population drops, predators do not have enough prey and so their population also drops. - When this happens, the prey population increases again. (b) The vegetation will also slowly disappear. (c) The two species will compete for the same prey and the inferior one is likely to be eliminated over time. - Since they both feed on the same prey, resources are limited causing the elimination of the inferior predator.	**2** **1** **1**
Q.30	a) - AUG UAC GGC AUG ACA UGG - (b) - yes	 **1** **½**

	- since the mRNA begins with a start codon (c) - MET-TYR-GLY-MET-THR-TRP - tRNA sequence: UAC (d) Only methionine will remain in the amino acid sequence as the second codon will get converted to a stop codon. (e) - point mutation - guanine is getting converted to another base, thymine, resulting in the loss of the gene	½ ½ 1 ½

SECTION E

Q.31	A) - man R - The percentage of similarity of DNA fragments between the child and the man is highest in man R. (b) DNA profiling/DNA fingerprinting (c) - Each individual has a unique pattern of mini-satellites or repeated DNA called VNTRs. - This can be used to identify an individual using DNA from any body part/fluid. (d) - twins/monozygotic twins - The DNA profiles of men Q and S are the same which is possible only if they come from the same zygote/if they are identical twins.	**1** **1** **1** **1** **1**
Q.32	Megasporogenesis is the process of formation of megaspores from the megaspore mother cell (MMC). Different stages of development of female gametophyte are: 1) In the nucleus of a developing ovule, one diploid cell develops into a diploid megaspore mother cell. 2) This megaspore mother cell divides by meiosis to produce four haploid megaspores which are arranged in a linear tetrad. 3) One of the megaspores is functional, while the other three degenerate in angiosperms. The lower chalazal megaspore produces the female gametophyte (embryo sac). 4) The nucleus of the functional megaspore divides mitotically into two nuclei. These are called primary micropylar and primary chalazal nuclei. 5) The second division produces one pair of nuclei at the micropylar end and one pair of nuclei at the chalazal end. The third division results in the formation of 4 nuclei at each pole. 6) One nucleus from each pole then migrates towards the centre to become polar nuclei, which fuse together and give rise to the secondary nucleus (2n). Out of these, the central one is the egg cell while the two lateral cells are called synergids. 	**1/2×6=3** **2**
Q 33	 a)	**1**

	Gene regulation in prokaryotes can be explained with the help of the Lac Operon model. Here the alteration in physiological and environmental conditions can be observed leading to an alteration in expression in prokaryotes. It was observed by Jacob and Monod. The lac operon consists of: Regulatory gene i – It codes for the repressor protein. z gene – It codes for beta-galactosidase which catalyzes the hydrolysis of lactose into glucose and galactose. y gene – It codes for permease which regulates the lactose permeability in the cell. a gene – It codes for transacetylase which assists the enzyme beta-galactosidase. Hence, all these genes help in lactose metabolism. In lac operon, lactose acts as an inducer. If lactose is provided in the medium for the bacteria, the regulatory gene is activated. The inducer will bind to the repressor protein and render it inactive which allows transcription of the operon. Thus, the lac operon is negatively regulated in this case.	**2**
	b) tRNA is charged by attaching an amino acid at one end. It then binds the ribosome-mRNA complex at the position defined by a codon that codes for an amino acid.	**1**
	c)The major difference between a lagging and leading strand is that the lagging strand replicated discontinuously forming short fragments, whereas the leading strand replicates continuously.	**1**

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SECTION- A

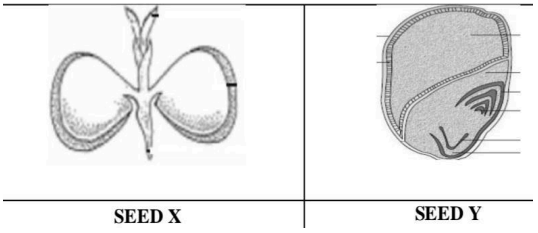
Q 1	A human ovum completes its second meiosis : (a) at the time of fertilisation (b) when the sperm touches the zona pellucida (c) when the sperm gains entry into the cytoplasm of the ovum (d) when the acrosome of the sperm releases its enzymes on corona radiata	**1**
Q.2	A biologist studied the population of rats in a barn. He found that leverage natality was 250, average mortality 240 ,immigration 20 and emigration 30. The net increase in population is-- A)10 B)15 C) zero D)05	**1**
Q.3	The number of nucleosomes present in human cell is A) 3.3 x 10000000 B)11 x 10000000 C) 6.6 x 10000000 D)Indefinite	**1**
Q.4	Evolutionary divergence is development of a- A) common set of functions in groups of different ancestry B) dissimilar set of structures in closely related group C) common set of structures in closely related groups D) similar set of functions in unrelated group	**1**
Q.5	Which of the following statements are true related to Seed X and Y?  SEED X SEED Y (i) Seed X is dicot and endospermic or albuminous. (ii) Seed X is dicot and non-endospermic or non-albuminous. (iii) Seed Y is monocot and endospermic or albuminous. (iv) Seed Y is monocot and non-endospermic or non-albuminous. Choose the correct option with the respect to the nature of the seed A. (i), (iii) B. (ii), (iii) C. (i), (iv) D. (ii), (iv)	**1**
Q.6	Figure A shows the front view of the human female reproductive system and Figure B shows the development of a fertilised human egg cell	

Figure A

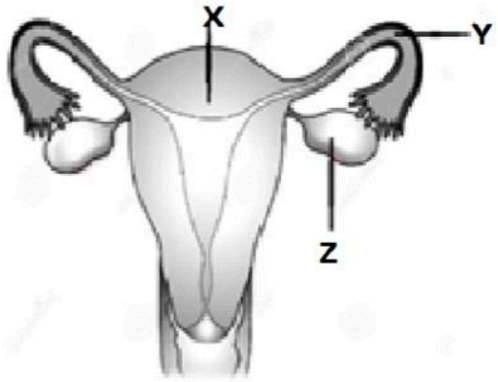
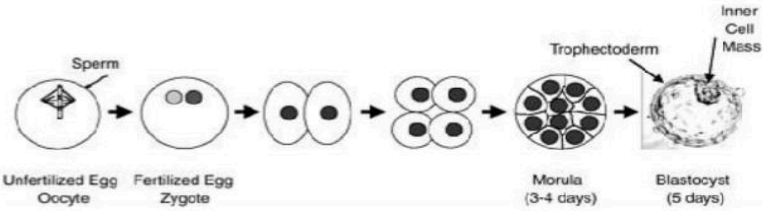


Figure B.



Identify the correct stage of development of human embryo (Figure B) that takes place at the site X, Y and Z respectively in the human female reproductive system (Figure A).

Choose the correct option from the table below:

	X	Y	Z
A	Morula	Fertilized egg	Blastocyst
B	Unfertilized egg	Fertilized egg	Morula
C	Blastocyst	Fertilized egg	Unfertilized egg
D	Fertilized egg	Morula	Blastocyst

1

Q 7 A stretch of an euchromatin has 200 nucleosomes. How many bp will there be in the stretch and what would be the length of the typical euchromatin?

A. 20,000 bp and 13,000 x10-9 m B. 10,000 bp and 10,000 x10-9 m

C. 40,000 bp and 13,600 x10-9 m D. 40,000 bp and 13,900 x10-9 m

1

Q.8 Which of the following statements indicates parallelism in genes and chromosomes?

(i) They occur in pairs (ii) They segregate during gamete formation

(iii) They show linkage (iv) Independent pairs segregate independently

A. (i) and (iii) B. (ii) and (iii) C. (i), (ii) and (iii) D. (i), (ii) and (iv)

1

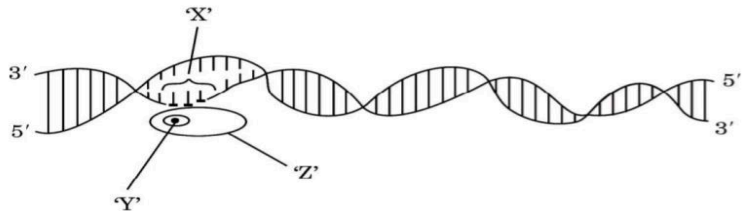
Q 9 Which of the following adaptations is not parasitic?

(a) Loss of unnecessary sense organs (b) Development of adhesive organs

(c) Loss of digestive organs (d) Loss of reproductive capacity

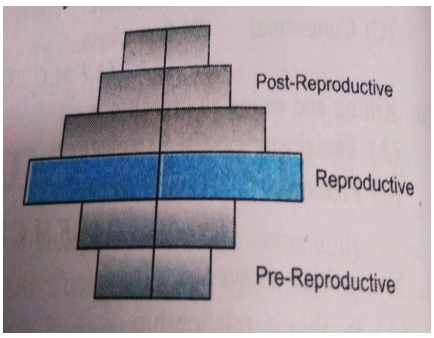
1

Q.10 Identify the region X,factor Y and enzyme Z involved in the process of transcription in prokaryote as shown in the schematic representation given below.

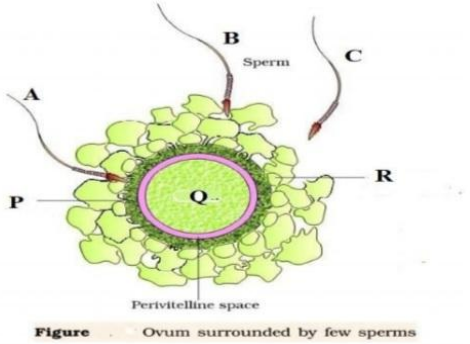


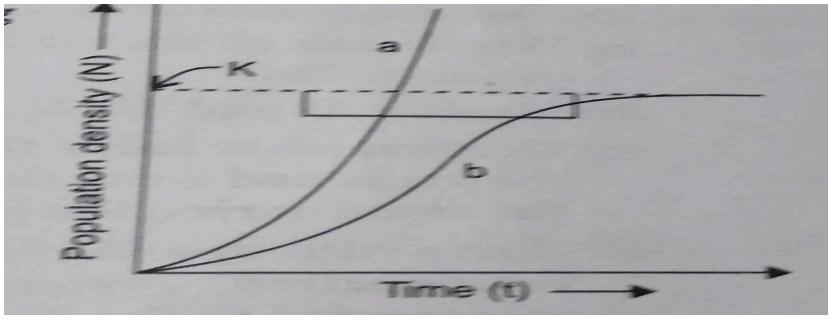
Region	Factor Y	Enzyme Z
(a) Terminator	Sigma	RNA polymerase
(b) Promoter	Rho	RNA polymerase
(c) Promoter	Sigma	RNA polymerase

1

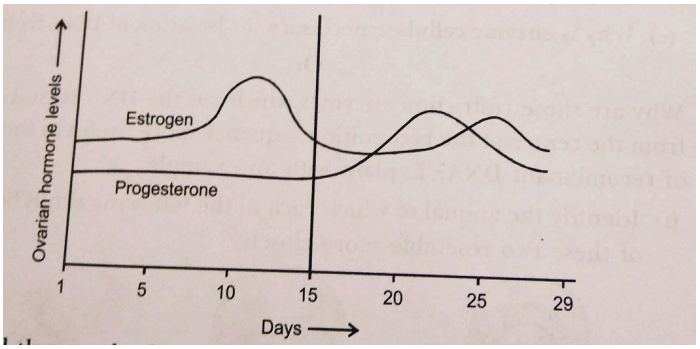
	(d) Promoter Sigma DNA polymerase	
Q.11	Which type of human population is represented by this age pyramid--  A) Declining population (B)Expanding population (C) Vanishing population (D)Stable population	**1**
Q.12	One of the ex situ conservation methods for endangered species is (A) wildlife sanctuary (B) biosphere reserves (C) cryopreservation (D) national parks.	**1**
Q.13	**Q.No. 13 to 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** **Assertion**: The nuclear divisions in the functional megaspore to form an embryo sac in angiosperms are strictly free nuclear. **Reason**: cell wall formation stars only at the 8 nucleate stage leading to the organisation of the typical female gametophyte.	**1**
Q 14	**Assertion:** A colour-blind father will always have a colour-blind son. **Reason:** Genes causing colour blindness are passed through a sex chromosome.	**1**
Q.15	**Assertion :** In the absence of a predator, the prey population growth will always be exponential. **Reason** : Exponential growth is when the resources and the environment allow an organism to realise fully its innate potential to grow in numbers.	**1**
Q 16	**Assertion**: The prickly pear cactus introduced into Australia in early 1920s caused havoc by spreading rapidly into millions of hectares of land range. **Reason:** When certain exotic species are introduced into a geographical area, they become invasive and start spreading fast because the invaded land does not have the natural predators.	**1**

SECTION-B

Q.17	The figure given below shows 3 sperms A, B and C. a) Which one of the three sperms will gain entry into the ovum? b) Describe the associated changes induced by it on P and Q.  **Figure** Ovum surrounded by few sperms	**2**

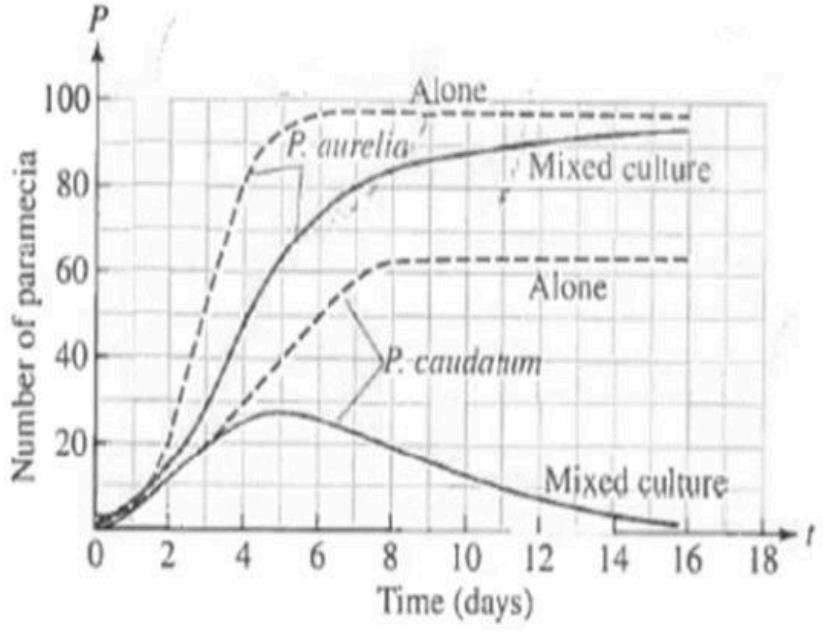
Q 18	i) If the sequence of the coding strand in a transcription unit is written as follows: 5'-CATATGGCACATGC-3' write down the sequence of m RNA. (ii) Why are both the strands of DNA not copied during transcription?Give one reason.	**2**
Q.19	Where does oogenesis take place in human females? Give the schematic representation of it.	**2**
Q.20	What is apomixis? Explain the two ways of development of apomictic seeds.	**2**
Q.21	Study the graph given below and answer the questions that follow– a) Write the name of the growth represented by a and b along with the equation. b) Which one of the two curves is considered a more realistic one for most of the animal populations?  	**2**

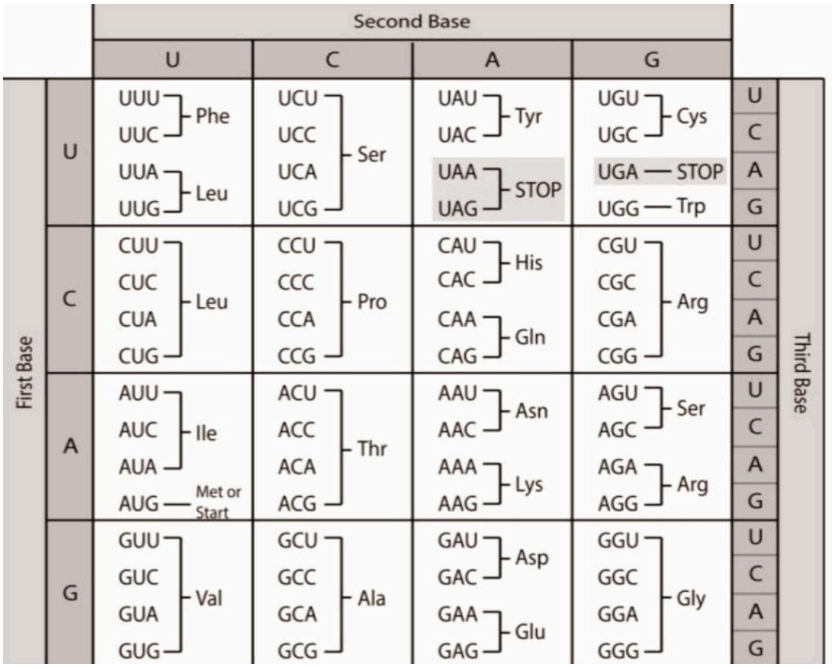
SECTION-C

Q.22	Answer the following questions based on Meselson and Stahl experiment in E.coli. a) write the name of the chemical substance used as the source of Nitrogen in the experiment. b) Why did they allow the synthesis of light and heavy DNA molecules in the organism? c) How did they distinguish the heavy DNA molecules from light DNA molecules? Explain . d) After 60 minutes how many heavy DNA molecules ,light DNA molecules and hybrid DNA molecules formed. e) Write the conclusion the scientists arrived at the end of the experiment.	**3**
Q.23	Give reason for the following--- A) Penicillium does not allow the growth of staphylococcus bacteria on a culture plate. B) Sucker fish attaches itself to the under surface of the shark with the help of its dorsal fin. C) Lichens represent an intimate relationship between a fungus and photosynthetic algae.	**3**
Q.24	 Read the graph given above and correlate the uterine events and ovarian events that take place according to hormonal levels on- a) 6-15 days b) 16-25 days c) 26-28 days(if the ovum is not fertilised). d) Specify the sources of hormones mentioned in the graph.	**3**
Q.25	In a population of 1000 individuals, 25% of individuals show the phenotype for sickle cell anaemia (genotype - ss).	

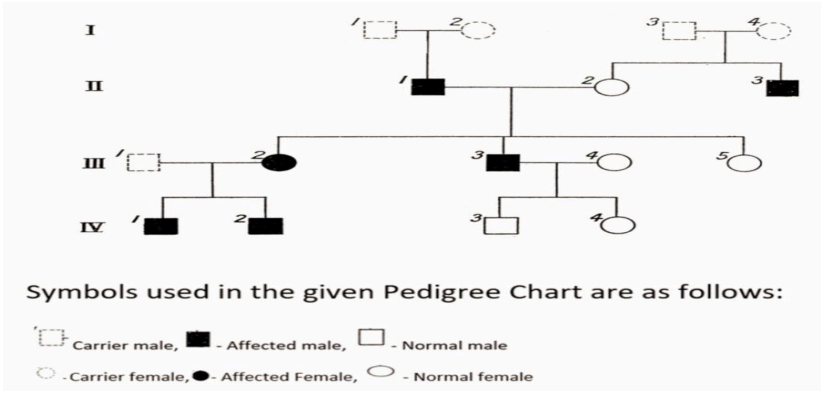
	(a) Assuming the population meets Hardy-Weinberg equilibrium, how many individuals would be carriers of the sickle cell allele but will not show the sickle cell phenotype? (b) Can the Hardy-Weinberg principle be used to predict the frequency of the presence of the sickle cell allele in a sperm cell? Why or why not?	**3**
Q.26	Latitudinal gradients have an impact on species diversity. While species diversity is highest at the tropics and lowest at the poles, loss of biodiversity also is highest in the tropics and lowest at the poles. (a) Mention ONE possible reason for the low species diversity at the poles. (b) Mention ONE possible reason for loss of biodiversity being higher in the tropics. (c) How have humans used temperature conditions to conserve biodiversity in ex situ condition.	**3**
Q.27	a)How is perisperm different from pericarp? b) Describe the most common method of endosperm development in angiosperms	**3**
Q.28	Outbreeding helps in the maintenance of an organism's ability to survive and perpetuate its genetic material. This is termed as biological fitness. (a) What is the term used to signify reduction of such biological fitness? (b) Explain one method of outbreeding devised by plants that requires a chemical intervention by the reproductive apparatus of a plant.	**3**

SECTION-D

Q.29	**CASE STUDY BASED QUESTIONS** Observe the graph given below. The graph represents inter-specific interaction between two species of Paramecia competing for the same resource in a culture medium. Paramecium caudatum and Paramecium aurelia were grown in separate cultures as well as in mixed cultures. It was found that each species grew in numbers according to the logistic equation. a) Which species is competitively superior? Support it with the data provided in the graph. b) State the underlying principle for the above result and name the scientist associated with this principle. c) Explain the mechanism in which two or more species competing with each others can co - exist.  	**4**
Q.30	Given below is a DNA sequence and the genetic code. Answer the questions based on these, assuming no post-transcriptional or post-translations modifications will take place. - TACATGCCGTACTGTACC -	

	 a) Write the nucleotide sequence that will be obtained on transcription of this DNA sequence. (b) Will translation of this sequence take place? Give a reason to support your answer. (c) What is the amino acid sequence that will be formed? Identify the sequence of the first tRNA. (d) If the first guanine base in the DNA sequence gets replaced by thymine, how will the amino acid sequence change? (e) Name and describe the mutation that occurred in (d).	**4**

SECTION-E

Q.31	Describe the formation of seven celled eight nucleate embryo sac from the Megaspore mother cell with well labelled diagrams.	**5**
Q.32	a) Describe switch on model of lac operon with diagram b) Explain why tRNA is called an adaptor molecule? c) Differentiate between leading and lagging strands of replication fork.	**5**
Q.33	Study the Pedigree chart given below and answer the questions that follow:  (a) On the basis of the inheritance pattern exhibited in this pedigree chart, what conclusion can you draw about the pattern of inheritance? (b) If the female is homozygous for the affected trait in this pedigree chart, then what percentage of her sons will be affected ? c) Give the genotype of offsprings 1,2,3 and 4 in III generation. (d) In this type of inheritance pattern, out of male and female children which one has less probability of receiving the trait from the parents. Give a reason.	**5**

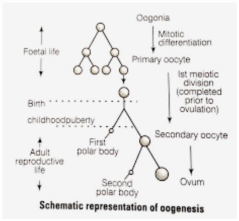
BIOLOGY-- XII Set B

SEPTEMBER EXAMINATION(2024)
ANSWER KEY AND MARKING SCHEME
SECTION A

Q 1	C	**1**
Q 2	C	**1**
Q 3	A	**1**
Q 4	C	**1**
Q.5	B	**1**
Q 6	C	**1**
Q 7	C	**1**
Q 8	D	**1**
Q.9	D	**1**
Q.10	C	**1**
Q.11	A	**1**
Q.12	C	**1**
Q 13	A	**1**
Q.14	D	**1**
Q.15	D	**1**
Q.16	A	**1**

SECTION B

Q.17	a) Sperm A b) In the figure given, Sperm A 'Has come in contact with the zona pellucida layer (P) of the ovum (Q), it will induce changes in the membrane that will block the entry of additional sperms (B and C). Thus, it ensures that only one sperm can fertilise the ovum. The secretions of the acrosome of sperm A will help it to enter into the cytoplasm of the ovum (Q) through the zona pellucida (P) and the plasma membrane, this will induce the completion of the meiotic division of the secondary oocyte (Q). The second meiotic division in Q being unequal will result in the formation of a second polar body and a haploid ovum. Then, the haploid nucleus of the sperm 'A' and that of the ovum (Q) will fuse together to form a diploid zygote.	½ ½ ½ ½
Q.18	**i) 5'**CAUAUGGCACAUGC**3'** ii)a)if both strands act as a template, they would code for RNA molecules with different sequences in turn, they code for proteins. the sequence of amino acids in the proteins would be different. One segment of the DNA would be coding for two different proteins, and this would complicate the genetic information transfer machinery. b)Second, the two RNA molecules if produced simultaneously would be complementary to each other. Hence would form a double stranded RNA. This would prevent RNA from being translated into protein and	**1** **1**

	the exercise of transcription would become a fertile one. (Any one)	
Q 19	i)Germinal epithelium of ovary ii)Page 49 NCERT chart of oogenesis Or  Schematic representation of oogenesis	½ ½+½+ ½
Q 20	Formation of seeds from ovules without fertilization is called Apomixis. There are two ways by which apomictic seeds can be produced: 1 **Agamospermy** In this method, seeds are produced from diploid cells without meiosis and fertilization e.g., apple. 2 **Adventive embryony**: In this method, nucellus and integuments extend into the embryo sac and develop an embryo. In this method, the formation of more than one embryo takes place and this condition is called polyembryony e.g., citrus fruit.	½ ½ **1**
Q.21	**a** exponential growth **dN/dt=rN** **b** logistic growth **dN/dt=rN(K-N/K)** **Curve b**	½ **1** ½

SECTION C

Q.22	a) heavy isotope of nitrogen 15NH4Cl b) They allowed the synthesis of light and heavy DNA molecules in order to create observable differences in parent and newly synthesized DNA strands based on differences in the density. c) The heavy and light DNA molecules were distinguished by centrifugation in a cesium chloride density gradient. d) 0 heavy, 2 hybrid and 6 light DNA e) semiconservative mode of DNA replication	½ ½ ½ **1** ½
Q.23	A)The mould Penicillium creates the secretion known as penicillin, which is extremely toxic to staphylococcus bacteria and this interaction is termed as amensalism. B)The suckerfish uses a sucker to attach itself to the shark. It uses sharks for their transportation. It also uses sharks for their food and nutrition which they get from the leftover food of the shark. They do not harm sharks in this process.This interaction is termed as commensalism. C) Symbiosis in lichens is the mutualistic relationship of algae living among filaments of a fungus. The fungus benefits from the algae because they produce food by photosynthesis. The fungus provides water, nutrients and shelter for the algae.	**1** **1** **1**
Q 24	a)6-15 days: It is the follicular phase where FSH stimulates ovarian follicles to secrete estrogen which in turn stimulates the proliferation of endometrium of uterine wall, which thickens.ovulation takes place at 14th day b) 16-25 days: Secretion of progesterone maintains endometrium which is necessary for implantation of a fertilized ovum or other events of pregnancy. c) 26-28 days: When fertilization does not take place, the endometrial lining disintegrates leading to menstruation and thus marking the new	**1** ½ ½

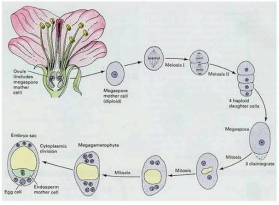
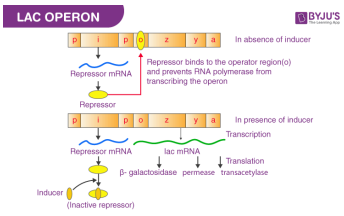
	cycle. d) Estrogen- follicular cells of ovary Progesterone- corpus luteum	 **1**
Q 25	(a) - q2 = 0.25, so q = 0.5 - p + q = 1 So, p = 1 - 0.5 = 0.5 - So, population that consists of carriers (Ss) = 2pq = 2 x 0.5 x 0.5 = 0.5 - Carrier individuals in a population of 1000 individuals = 0.5 x 1000 = 500 individuals (b) - No, it cannot be used. - The Hardy-Weinberg principle takes into account only diploid organisms/organisms with two alleles for a trait.	**½** **½** **½+½** **1**
Q.26	(a) - low incident solar radiation results in low productivity - extremely cold conditions do not favour survival of many species (b) - greater competition between species - greater climatic variations - harsh climatic conditions for many species (c) In cryopreservation, low temperature conditions are used to preserve biological constructs.	**1** **1** **1**
Q.27	a)Persistent remains of the nucellus in the seed is called perisperm Walls/covering of the fruit which is formed by the walls of the ovaries is termed as pericarp b)The most common type of endosperm development in angiosperms is the nuclear type. In this type of development, the first division of the primary endosperm nucleus and few subsequent nuclear divisions are not accompanied by wall formation. The nuclei produced are free in the cytoplasm of the embryo sac . These nuclei may remain free indefinitely or may form walls later. Coconut is an example .	**1** **2**
Q.28	(a) inbreeding depression (b) - self incompatibility - The pollen of a plant is not allowed to germinate on the stigma of the same flower or on a different flower of the same plant due to pollen-pistil interaction.	**1** **1** **1**

SECTION-D

Q.29	a) P. aurelia species is competitively superior P. aurelia grows in numbers more quickly than P.caudatum and shows more individuals in the same volume of culture/ 100 Paramecium aurelia in 6 days whereas 60 P. caudatum in 8 days. b) Competitive Exclusion Principle' which states that two closely related species competing for the same resources cannot coexist indefinitely and the competitively inferior one will be eliminated.G.F. Gause, c) One such mechanism is 'resource partitioning'. If two species compete for the same resource, they could avoid competition by choosing different times for feeding or different foraging patterns, to avoid competition and co-exist due to behavioural differences in their foraging activities.	**2** **1** **1**
Q.30	a) - AUG UAC GGC AUG ACA UGG - (b) - yes - since the mRNA begins with a start codon	 **1** **½**

	(c) - MET-TYR-GLY-MET-THR-TRP - tRNA sequence: UAC (d) Only methionine will remain in the amino acid sequence as the second codon will get converted to a stop codon. (e) - point mutation - guanine is getting converted to another base, thymine, resulting in the loss of the gene	½ ½ **1** ½

SECTION E

Q.31	Megasporogenesis is the process of formation of megaspores from the megaspore mother cell (MMC). Different stages of development of female gametophyte are: 1) In the nucleus of a developing ovule, one diploid cell develops into a diploid megaspore mother cell. 2) This megaspore mother cell divides by meiosis to produce four haploid megaspores which are arranged in a linear tetrad. 3) One of the megaspores is functional, while the other three degenerate in angiosperms. The lower chalazal megaspore produces the female gametophyte (embryo sac). 4) The nucleus of the functional megaspore divides mitotically into two nuclei. These are called primary micropylar and primary chalazal nuclei. 5) The second division produces one pair of nuclei at the micropylar end and one pair of nuclei at the chalazal end. The third division results in the formation of 4 nuclei at each pole. 6) One nucleus from each pole then migrates towards the centre to become polar nuclei, which fuse together and give rise to the secondary nucleus (2n). Out of these, the central one is the egg cell while the two lateral cells are called synergids. 	**1/2×6=3** **2**
Q 32	 a) Gene regulation in prokaryotes can be explained with the help of the Lac Operon model. Here the alteration in physiological and environmental conditions can be observed leading to an alteration in expression in prokaryotes. It was observed by Jacob and Monod. The lac operon consists of: Regulatory gene i – It codes for the repressor protein. z gene – It codes for beta-galactosidase which catalyzes the hydrolysis of lactose into glucose and galactose. y gene – It codes for permease which regulates the lactose permeability in the cell. a gene – It codes for transacetylase which assists the enzyme beta-galactosidase. Hence, all these genes help in lactose metabolism. In lac operon, lactose acts as an inducer. If lactose is provided in the medium for the bacteria, the regulatory gene is activated. The inducer will bind to the repressor protein and render it inactive which allows transcription	**1** **2**

	of the operon. Thus, the lac operon is negatively regulated in this case. b) tRNA is charged by attaching an amino acid at one end. It then binds the ribosome-mRNA complex at the position defined by a codon that codes for an amino acid. c)The major difference between a lagging and leading strand is that the lagging strand replicated discontinuously forming short fragments, whereas the leading strand replicates continuously.	**1** **1**
Q.33	a) X- linked , Recessive trait (b) 100% (c) 1.XY, 2. XhXh, 3. XhY, 4. XX The possibility of the female getting the trait is less. The female will get the trait only if the mother is at least a carrier and the father is affected.	½ ½ **2** **2**