

**DESIGN OF THE QUESTION PAPER**  
**BIOLOGY-CLASS XII**

Hrs : 3 Hrs.

Max. Marks : 70

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

**Weightage to content/subject units**

<b><u>Units</u></b>	<b><u>Content</u></b>	<b><u>Marks</u></b>
1.	Reproduction	14
2.	Genetics and evolution	18
3.	Biology and Human Welfare	14
4.	Biotechnology and its applications	10
5.	Ecology and environment	14
	<b>Total</b>	<b>70</b>

**Weightage to different form of questions**

<b><u>S. No.</u></b>	<b><u>Form of Questions</u></b>	<b><u>Marks for each</u></b>	<b><u>No. of Questions</u></b>	<b><u>Total Marks</u></b>
1.	Very Short Answer(VSA)	1	8	08
2.	Short Answer (SA II)	2	10	20
3.	Short Answer (SA I)	3	09	27
4.	Long Answer (LA)	5	3	15
	<b>TOTAL</b>	<b>-</b>	<b>30</b>	<b>70</b>

**Scheme of Options**

1. There will be no overall option.
2. Internal choices (either/or type) on a very selective basis has been provided. This choice has been given in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage.

**Weightage to difficulty level of questions.**

<b><u>S.No.</u></b>	<b><u>Estimated difficulty level</u></b>	<b><u>Percentage</u></b>
1.	Easy	15
2.	Average	70
3.	difficult	15

About 20% weightage has been assigned to questions testing higher order thinking skills of learners.

**BLUE PRINT I**  
**BIOLOGY**  
**CLASS XII**

S. No	Type of Questions ↓ Units →	VSA (1 mark)	SA II (2 marks)	SA I (3 marks)	LA (5 marks)	Total
1.	Reproduction	2(2)	4(2)	3(1)	5(1)	14(6)
2.	Genetic and Evolution	2(2)	2(1)	9(3)	5(1)	18(7)
3.	Biology in Human Welfare	1(1)	10(5)	3(1)	-	14(7)
4.	Biotechnology	1(1)	-	9(3)	-	10(4)
5.	Ecology and Environment	2(2)	4(2)	3(1)	5(1)	14(6)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

**SAMPLE QUESTION PAPER**  
**XII- BIOLOGY**  
**(2010)**

**Time : 3 Hrs**

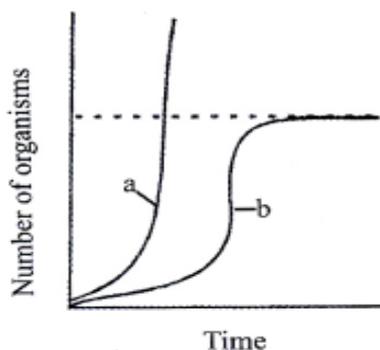
**MM: 70**

**General Instructions :**

- (i) *All questions are compulsory.*
- (ii) *This question paper consists of four Sections A, B, C and D. Section A contains 8 questions of one mark each, Section B is of 10 questions of two marks each, Section C is of 9 questions of three marks each and Section D is of 3 questions of five marks each.*
- (iii) *There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.*
- (iv) *Wherever necessary, the diagrams drawn should be neat and properly labelled.*

**Section - A**

1. The turkey usually produces females for several generations. How is this possible?
2. The meiocyte of an onion plant contains 32 chromosomes. Work out the number of chromosomes found in its endosperm.
3. The gene I that controls the ABO blood grouping in human beings has three alleles  $I^A$ ,  $I^B$  and  $i$ .
  - (a) How many different genotypes are likely to be present in the human population ?
  - (b) Also, how many phenotypes are possibly present ?
4. Pick out the ancestral line of Cycads from the list given below -  
Ferns, herbaceous lycopods, seed ferns, and horsetails
5. Name the source of smack. Mention one way in which it affects the human body.
6. In plants, how is alien DNA introduced into the host cell ?
7. Mr. Galgotia eats curd / yoghurt. In this case, which trophic level will he occupy?
8. In the absence of the predators, which curve, a) or (b) would appropriately depict the prey population ?



## Section - B

9.



Identify the type of flower shown in A and B. Which out of the two will produce an assured seed set.

10. Fed up of a large family, a couple wanted to adopt a terminal method of contraception. Describe the process conducted by the doctor in either of the cases (male / female partner)

**OR**

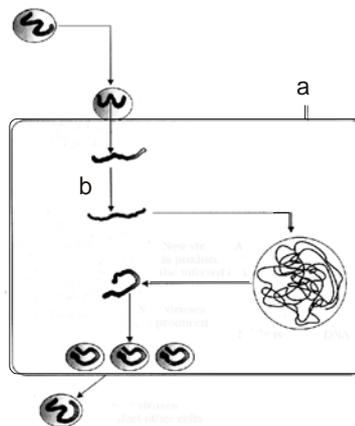
A mother of a one year old daughter wanted to space her second child. Her doctor suggested CuT. Explain its contraceptive actions.

11. The human male and female bird are heterogametic while the human female and male bird are homogametic. Why are they called so?
12. What are interferons. Explain its role in providing immunity. Also name the kind of immunity provided by it.
13. What is allergy? Name the antibody responsible for it. Also mention two chemicals released from the mast cells during an allergic reaction.
14. Give reason -
- Bottled fruit juices bought from the market are clearer as compared to those made at home.
  - Large holes are found in "Swiss cheese".
15. In which parts of the body of the hosts do the following events in the life cycle of *Plasmodium* take place. Along with the body parts name the hosts too -
- Fertilisation
  - Development of gametocytes
  - Release of sporozoites
  - Asexual reproduction

16. What are the latest methods of detection of cancer?
17. State two important defence mechanisms in plants against herbivory, with an example each.
18. Compare the grazing food chain and detritus food chain in the aspect of their (a) origin and (b) energy status.

**Section - C**

19. Draw a labelled diagram of the sectional view of a mature pollen grain of angiosperms. Explain the function of any two of its parts.
20. In a pea plant, smooth seed coat is dominant over wrinkled seed coat. What will be the expected ratio of phenotypes of the offspring in a cross between
  - (i) Heterozygous smooth  $\times$  Heterozygous smooth
  - (ii) Heterozygous smooth  $\times$  Homozygous wrinkled
  - (iii) Heterozygous smooth  $\times$  Homozygous smooth
21. A tRNA is charged with aminoacid methionine
  - (i) Name the process involved in the attachment
  - (ii) Point out the mRNA codon and anticodon on tRNA for this aminoacid.
  - (iii) What is heterochromatin?
22. (a) State Hardy Weinberg principle. Name any two factors which affect it.  
 (b) Draw a graph to show that natural selection leads to directional change.
- 23.



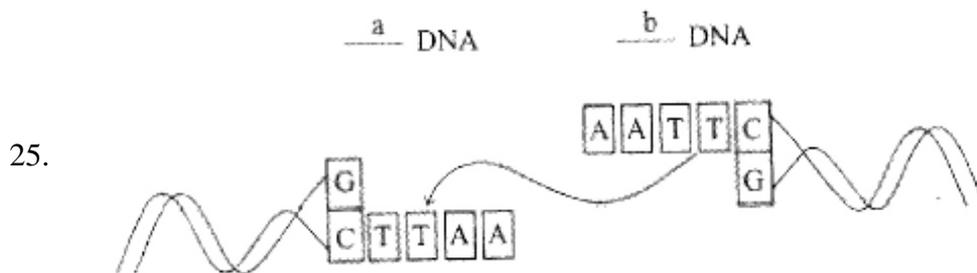
- (i) What does this diagrammatic sketch depict ?
- (ii) Identify 'a' and 'b'
- (iii) Name the widely used diagnostic test when a person gets this disease.

OR

Fill in the blanks in the different column of the table given below :

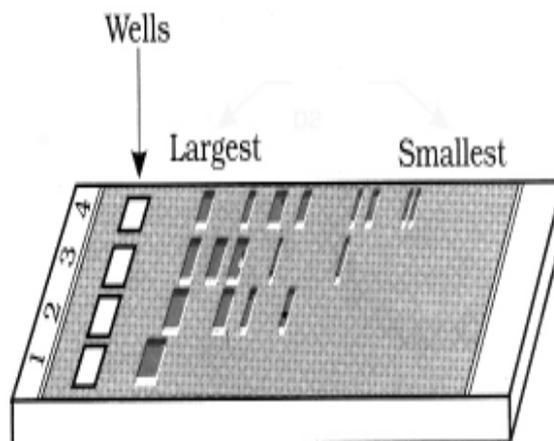
Disease	Casual organisms	Medium of transfer	Symptoms
Amoebiasis	Entamoeba histolytica	a	Diarrhoea
Typhoid	b	Contaminated food	sustained high fever
c	Plasmodium	Bite of infected female Anopheles mosquito	Chill and high fever
Pneumonia	Streptococcus	d	Fever and cough

24. A crane had DDT level as 5 ppm in its body. What would happen to the population of such birds ? Explain giving reasons.



Study the linking of DNA fragments shown above.

- (i) Name 'a' DNA and 'b' DNA  
(ii) Name the restriction enzyme that recognises this palindrome  
(iii) Name the enzyme that can link these two DNA fragments.
- 26.



- (a) What does this diagram depict?  
(b) What is meant by largest and smallest in the picture.  
(c) Name the compound used to visualise them.

- (d) Define elution.
27. Explain with reference to PCR
- (a) A specific enzyme helps in amplification in PCR. Name the bacterium from which it is isolated and state how its thermostable nature is helpful.
  - (b) Explain its use in molecular diagnosis.

**Section - D**

28. A woman has conceived and implantation has occurred in her uterus. Explain the sequence of changes upto parturition which take place within her body.

OR

“Incompatibility is a natural barrier in the fusion of gametes”. Justify the statement.

29. (a) Give reasons for -
- (i) Both strands of DNA are not copied during transcription.
  - (ii) Transcription and translation in bacteria can be coupled.
- (b) Differentiate between the process of transcription in prokaryotes and eukaryotes.

OR

Stanley Miller performed an experiment by recreating in the lab the probable conditions of the atmosphere of the primitive earth.

- (i) What was the purpose of the experiment ?
  - (ii) In what form was the energy supplied for the chemical reaction to occur?
  - (iii) What is biogenesis?
  - (iv) Give a diagrammatic representation of Miller’s experiment.
30. (a) On seeing the bad state of roads in your locality, as a student, you have recommended to the Municipal Corporation to use polyblend.
- (i) What is polyblend? Point out its raw material?
  - (ii) How will it be advantageous?
- (b) What are e-wastes? Explain the method of their disposal.

OR

- (a) What is meant by ecological succession? How does it occur? Explain.
- (b) Differentiate between Primary and Secondary succession.

**MARKING SCHEME**  
**SAMPLE QUESTION PAPER**  
**XII - BIOLOGY**  
**(2010)**

**Section - A**

- A1 In a turkey, female gametes undergo development without fertilisation. This phenomenon is called parthenogenesis. [1 Mark]
- A2
- meiocyte has 32 chromosomes (2n)
  - hence its gamete will have  $32/2 = 16$  chromosomes
  - therefore endosperm will have  $16 \times 3 = 48$  chromosomes (3n)
- [1 Mark]
- A3 (a) 6, (b) 4 [1 Mark]
- A4 Seed ferns [1 Mark]
- A5 Source - latex of poppy plant (*Papaver somniferum*) =  $\frac{1}{2}$   
Effect - Acts as a depressant. =  $\frac{1}{2}$  [1 Mark]
- A6 The plant cells are bombarded with high velocity micro - particles of gold or tungsten coated with DNA in a method known as biolistics or gene gun. [1 mark]
- A7 Third trophic level [1 Mark]
- A8 Curve 'a' [1 Mark]

**Section - B**

- A9 A - Chasmogamous flower =  $\frac{1}{2}$   
B - Cleistogamous flower =  $\frac{1}{2}$   
Cleistogamous flower produces an assured seed set. [1 Mark]
- A10 **Male Partner** : Vasectomy - a small part of the vas deferens is removed or tied up through a small incision in the scrotum.  
**Female Partner** : Tubectomy - a small part of the fallopian tube is removed or tied up through a small incision in the abdomen or through vagina. [1 Mark]

OR

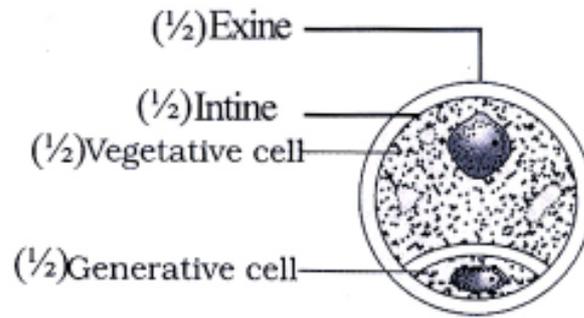
CuT release  $\text{Cu}^+$  ions, increases phagocytosis of sperms, suppresses sperm motility, reduces fertilising capacity. =  $\frac{1}{2} \times 4 = 2$

[2 Marks]

- A11 Genotype of human male is - XY  
 Genotype of female bird is - ZW = ½  
 The sex chromosomes are dissimilar and hence are called heterogametic. = ½  
 Genotype of human female is XX  
 Genotype of male bird is ZZ = ½  
 The sex chromosomes are similar, hence homogametic = ½  
 [½ + ½ + ½ + ½ = 2 Marks]
- A12 Interferons are proteins secreted by virus - infected cells. = ½  
 Role : It protects non - infected cells from further viral infection = 1  
 Innate Immunity = ½  
 [½ + 1 + ½ = 2 Marks]
- A13 The exaggerated response of the immune system to certain antigens present in the environment = ½  
 IgE = ½  
 Histamine and serotonin = ½ + ½ = 1  
 [ ½ + ½ + 1 = 2 Marks]
- A14 (a) Bottled juices are clarified by the use of pectinases and proteases = ½ + ½ = 1  
 (b) Large holes are due to production of large amount of CO<sub>2</sub>, by a bacterium named *Propionibacterium sharmanii* = ½ + ½ = 1  
 [ 1 + 1 = 2 Marks]
- A15 (i) Inside stomach / intestine of Mosquito host  
 (ii) In the blood of human host  
 (iii) Into the blood of human host  
 (iv) Inside liver cells and RBCs of human host.
- A16 Surgery, radiation therapy, chemotherapy and immunotherapy  
 [½ × 4 = 2 Marks]
- A17 (a) Thorns are the most common morphological means of defence eg. Acacia and Cactus = 1  
 (b) Many plants produce and store toxic chemicals such as cardiac glycosides to discourage browsing animals. eg. Calotropis = 1  
 [ 1 + 1 = 2 Marks]
- A18 (a) Grazing food chain starts from producers while detritus food chain starts from organic matter = 1  
 (b) Grazing food chain is the major conduit of energy flow in an ecosystem = 1  
 [ 1 + 1 = 2 Marks]

### Section - C

A19



$$= \frac{1}{2} \times 4 = 2$$

Exine - It can withstand high temperature / strong acids / alkali

Intine - It is a thin and continuous layer made up of cellulose and pectin

Vegetative Cell - It is bigger, has abundant food reserve.

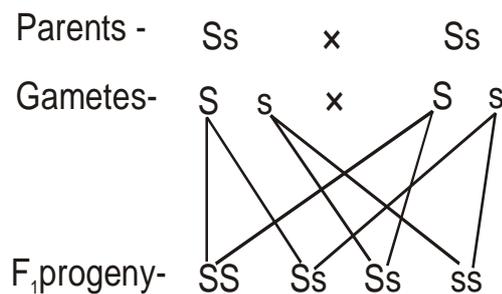
Generative Cell - It divides mitotically to give rise to two male gametes. (any two =  $\frac{1}{2} \times 2 = 1$ )

[ 2 + 1 = 3 Marks]

A20 Smooth seed coat (dominant) = S

Wrinkled seed coat (recessive) = s

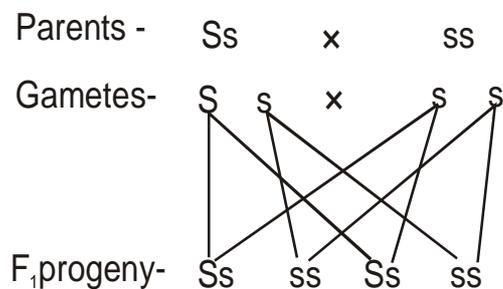
(i) Heterozygous smooth  $\times$  Heterozygous smooth



3 smooth : 1 wrinkled

= 3 : 1 ratio

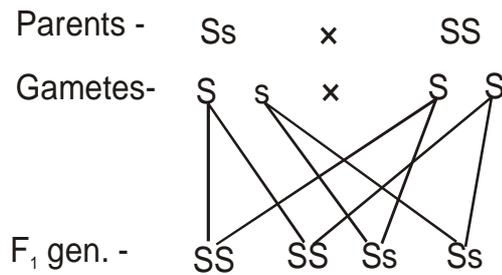
(ii) Heterozygous smooth  $\times$  Homozygous wrinkled



Phenotype - 2 smooth : 2 wrinkled

= 1 : 1

(iii) Heterozygous smooth  $\times$  Homozygous smooth



Phenotype - All smooth  
= 1 : 0

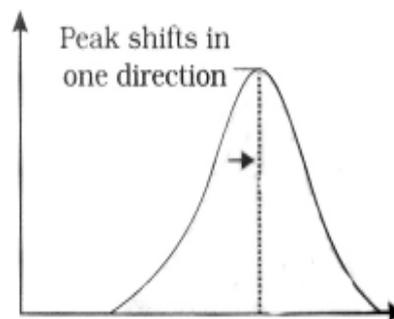
[1+1+1 = 3 Marks]

- A21 (i) Initiation = 1  
(ii) mRNA codon = AUG = 1  
(iii) The densely packed and dark stained / transcriptionally inactive chromatin is called as heterochromatin = 1

[1+1 + 1 = 3 Marks]

- A22 (a) Allelic frequencies in a population are stable and constant from generation to generation. = 1  
Gene flow, genetic drift, mutation, genetic recombination, natural selection (any two =  $\frac{1}{2} \times 2 = 1$ )

(b)



[1 + 1 + 1 = 3 Marks]

- A23 (i) Replication of retrovirus = 1  
(ii) a - Plasmamembrane  
b- formation of viral DNA by reverse transcriptase  $\frac{1}{2} \times 2 = 1$   
(iii) ELISA (Enzyme linked immunosorbent assay) = 1

[1 + 1 + 1 = 3 Marks]

OR

- (a) Water, vegetables, fruits etc. contaminated with the eggs of the parasite.  
(b) Salmonella typhi  
(c) Malaria  
(d) Pneumonia spreads by cough and sneezes by sharing drinking glasses and eating utensils with an infected person and contact with used tissues or handkerchief.

[1 + 1 + 1 = 3 Marks]

A24 Population of birds will decrease. High concentration of DDT disturbs calcium metabolism in birds which causes thinning of eggshell and their premature breaking, eventually causing decline in bird populations.

[ 3 Marks]

A25 (i) 'a' – Vector DNA; 'b' – Foreign DNA = ½

(ii) EcoRI

(iii) DNA ligase

[½ + 1 + 1½ = 3 Marks]

A26 (a) Gel electrophoresis = ½

(b) DNA fragments / bands = ½

(c) Ethidium bromide = 1

(d) The separated bands of DNA are cut out from agarose gel and DNA extracted from gel piece = 1

[½ + ½ + 1 + 1 = 3 Marks]

A27 (a) *Thermus aquaticus* = 1

It remains active during the high temperature induced denaturation = 1

(b) Very low concentration of a bacteria or virus can be detected by amplification of their nucleic acid by PCR = 1

[1 + 1 + 1 = 3 Marks]

### Section - D

- A28 • After implantation the chorionic villi and uterine tissue become interdigitated to form placenta.
- Placenta facilitates supply of O<sub>2</sub> & nutrients to the embryo and removes CO<sub>2</sub> & excretory materials produced by the embryo.
  - Increased production of hormones like estrogens, progesterone, prolactin are essential for supporting foetal growth, metabolic changes in the mother & maintenance of pregnancy.
  - The inner cell mass differentiates into three distinct germ layers (mesoderm, ectoderm & endoderm) which give rise to all tissues (organs) in adults.
  - After one month of pregnancy the embryo's heart is formed.
  - By the end of the second month of pregnancy the foetus develops limbs & digits.
  - By the end of 12 weeks (first trimester) most of the major organ systems are formed.
  - By the end of 24 weeks (second trimester) the body is covered with fine hair, eye-lids separate and eyelashes are formed.
  - The signals for parturition originate from the fully developed foetus and the placenta which induce mild uterine contractions called foetal ejection reflex.
  - This triggers release of oxytocin from maternal pituitary along with stimulatory reflex resulting in stronger contractions leads to parturition. = ½ × 10 = 5

[5 Marks]

OR

- Incompatibility is considered as the most widespread & effective device to prevent inbreeding and outbreeding.
- Pollen pistil interaction is a dynamic process involving pollen recognition followed by promotion or inhibition of the pollen.

- It acts as a natural barrier by the interaction of chemical substances produced by the style.
- Normally the pollen belonging to right mating type germinate on stigma, develop pollen tube & bring about fertilization.
- The pollen grains belonging to other mating type are discarded =  $1 \times 5 = 5$

[5 Marks]

30. (a) (i) It is a fine powder of recycled modified plastic. This mixture is mixed with bitumen used to lay roads = 1  
Raw material - Plastic film waste = 1
- (ii) Blends of polyblend & bitumen, when used to lay roads, enhances the bitumen's water repellent properties and helps to increase road life by a factor of three = 1
- (b) Irreparable computers and other electronic goods are known as e-wastes = 1  
Buried in landfills or incinerated = 1

[1+1+1+1+1 = 5 Marks]

OR

- (a) The gradual and fairly predictable change in the species composition of a given area = 1  
During succession some species colonise an area & their populations become more numerous, whereas populations of other species decline and even disappear =  $1 + 1 = 2$

(b) **Primary Succession**

**Secondary Succession**

It occurs in an area which has been bare from the beginning.

Soil is absent at the time of beginning of primary succession.

Takes a long time for completion.

It occurs in an area which has been denuded recently.

Soil is present in the area where secondary succession begins.

Takes less time for completion

(any two differences  $1 \times 2 = 2$ )

[ 1 + 2 + 2 = 5 Marks]

**BLUE PRINT II**  
**BIOLOGY**  
**CLASS XII**

<b>S. No</b>	<b>Type of Questions</b> → ↓ <b>Units</b>	<b>VSA</b> <b>(1 mark)</b>	<b>SA II</b> <b>(2 marks)</b>	<b>SA I</b> <b>(3 marks)</b>	<b>LA</b> <b>(5 marks)</b>	<b>Total</b>
1.	Reproduction	2(2)	6(3)	6(2)	-	14(7)
2.	Genetic and Evolution	2(2)	2(1)	9(3)	5(1)	18(7)
3.	Biology in Human Welfare	1(1)	4(2)	9(3)	-	14(6)
4.	Biotechnology	2(2)	-	3(1)	5(1)	10(4)
5.	Ecology and Environment	1(1)	8(4)	-	5(1)	14(6)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

## Sample Question Paper II XII- Biology

Time : 3 Hours

Max. Marks : 70

### GENERAL INSTRUCTIONS :

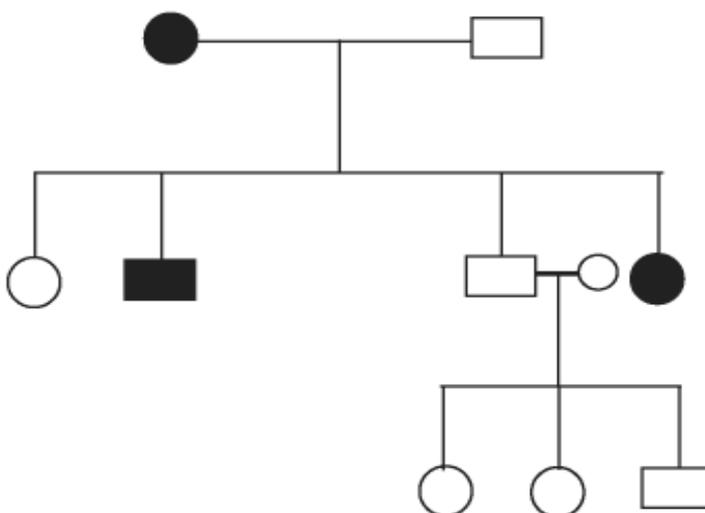
1. All questions are compulsory.
2. The question paper consists of four sections A, B, C and D. Section-A contains 8 questions of 1 mark each, Section B is of 10 questions of 2 marks each, Section C has 9 questions of 3 marks each whereas Section D is of 3 questions of 5 marks each.
3. There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.
4. Wherever necessary, the diagrams drawn should be neat and properly labelled.

### SECTION - A

- (1) In the whiptail lizards only females are born generation after generation. There are no males How is this possible? 1
- (2) In the following figure of a fruit, label the part which is protective in function and that which is responsible for producing new plants. 1



- (3) Which Mendel's law of inheritance is universally acceptable and without any exception? State the law. 1
- (4) In the following pedigree chart, state if the trait is autosomal dominant, autosomal recessive or sex linked. a reason for your answer.

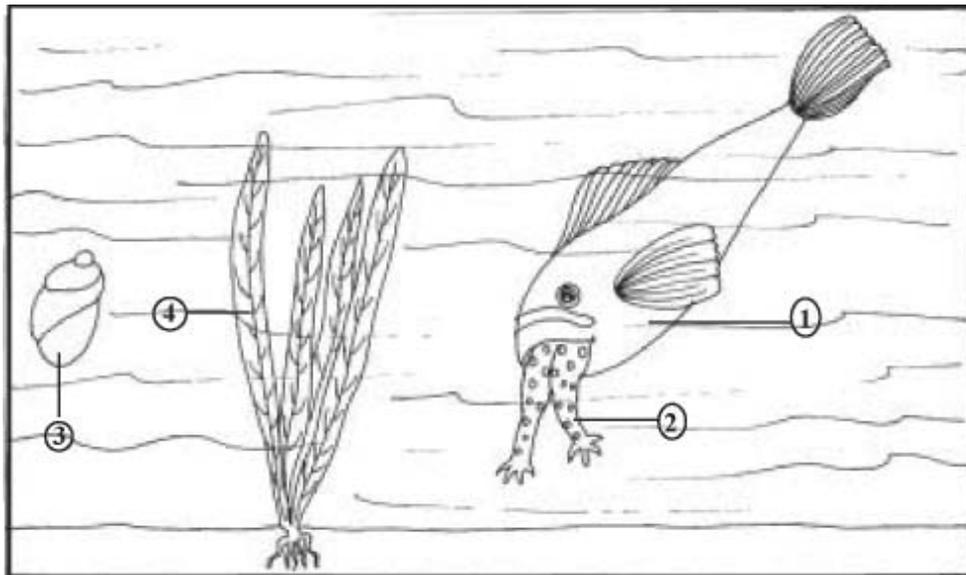


(195)

(5) Given below are pairs of disease and causative organism. Which out of these is not a matching pair and why?

- 2 Filariasis : *Wuchereria*
- Ringworm : *Ascaris*
- AIDS : Human immuno virus
- Malaria : *Plasmodium*

(6) In the picture provided, what is the relationship between (1) and (2) with respect to population interaction and between (3) and (4) with respect to trophic levels.

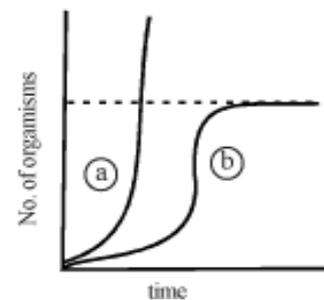


(7) Provide one word or one sentence information about 'plasmid' with respect to its (i) chemical nature and (ii) its duplication.

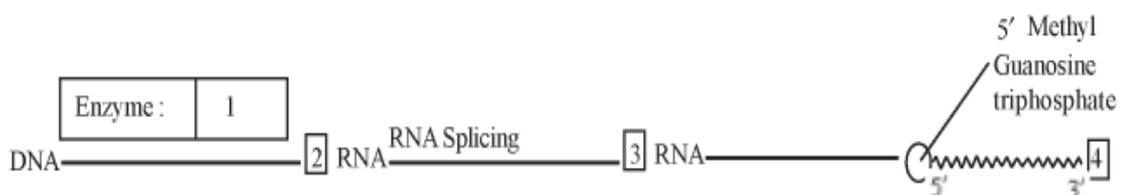
(8) Expand the following (i) PCR (ii) Bt

**SECTION -B**

(9) In the adjacent population growth curve, (i) What is the status of food and space in the curves (a) and (b)? (ii) In the absence of the predators, which curve (a) or (b) would appropriately depict the prey population?



(10) Given below is a sequence of steps of transcription in a eukaryotic cell. Fill up the blanks (1, 2, 3, 4) left in the sequence.



**OR**

- (10) Certain molecular processes are given in column (A). Provide the terms given to these processes in column (B), after selecting them from the terms: Recombination, gene regulation, prokaryotic, transcription, eukaryotic transcription, translation, replication, gene transfer, DNA fingerprinting

<b>Column A</b>		<b>Column B</b>
(i) DNA	→	DNA
(ii) DNA	→	hnRNA
(iii) mRNA	→	Protein
(iv) Repressor Protein + Operator	→	No transcription

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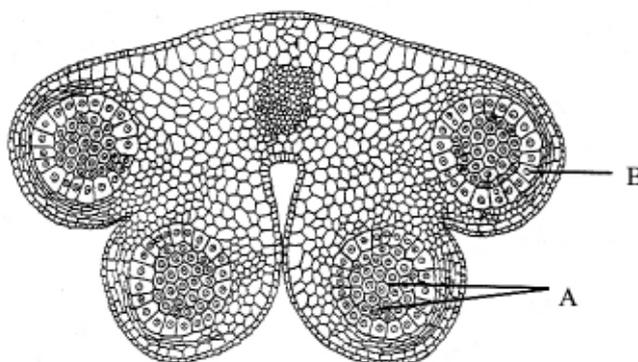
$\frac{1}{2} \times 4 = 2$

- (11) In the following table the ecological units are mentioned in the first column vertically and their attributes are mentioned horizontally. Match the ecological units and its attribute and put a tick in the blanks within the table:

2

Attribute Ecological → Unit ↓	Age	Flow of Energy	Natality	Predator-prey relationship
Individual organism				
Population				
Community				
Ecosystem				

- (12) In the T.S. of a mature anther given below identify “A” and “B” and mention their function.



- (13) In the table given below, select and enter one correct device out of the following :  
Oral pill, condom, Copper T, Saheli, Vasectomy, Diaphragm, Tubectomy, Cervical cap

Method of birth control	Device
Barrier	
IUD	
Surgical Technique	
Administering Hormones	

- (14) If the chromosome number of a plant species is 16, what would be the chromosome number and the ploidy level of the (i) microspore mother cell and (ii) the endosperm cells? 2
- (15) In the pie charts (A) and (B) drawn below to show the global animal diversity, which groups of animals would you name and write on the areas shaded black in (A) and (B). In which kind of habitat would you find these groups of animals? 2

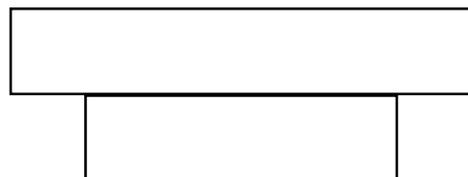


(A) INVERTERBRATES



(B) VERTEBRATES

- (16) In the pyramid of biomass drawn below, name the two crops : (i) one which is supported and (ii) the one which supports. In which ecosystem is such a pyramid found?  $(\frac{1}{2} + \frac{1}{2} + 1) = 2$



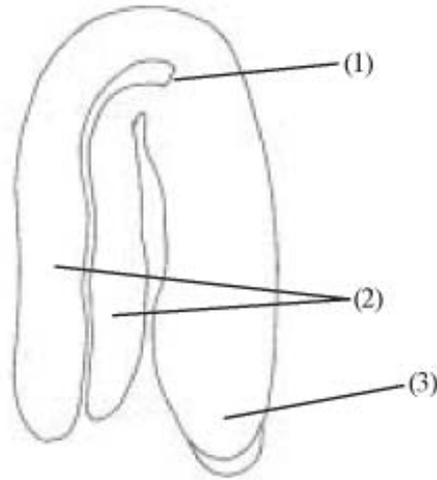
- (17) The steps in a programme are: 2
- Collection of germplasm
  - Crossbreeding the selected parents
  - Selecting superior recombinant progeny
  - Testing, releasing and marketing new cultivars.
- (i) What is this programme related to?
- (ii) Name two special qualities as basis of selection of the progeny.
- (iii) What was the outcome of the programme?
- (iv) What is the popular term given to this outcome? Also name the Indian scientist who is credited with chalking out of this programme.

- (18) What is measured in BOD test ? BOD level of three samples of water labelled as A, B and C are 30 mg/l, 10 mg/l and 500 mg/l respectively. Which sample of water is most polluted ?

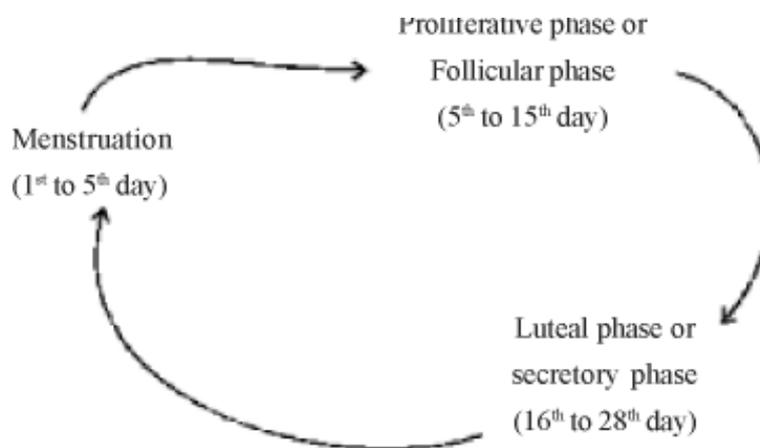
**SECTION - C**

- (19) How are biofertilisers different from fertilisers such as NPK that we buy in the market? Justify the role of *Rhizobium* as a biofertiliser. 3

- (20) In the adjacent figure of a typical dicot embryo, label the parts (1), (2) and (3). State the function of each of the labelled part. 3



- (21) The events of the menstrual cycle are represented below. Answer the questions following the diagram.



- (i) State the levels of FSH, LH and Progesterone simply by mentioning high or low, around 13<sup>th</sup> and 14<sup>th</sup> day and 21<sup>st</sup> to 23<sup>rd</sup> day
- (ii) In which of the above mentioned phases does the egg travel to the fallopian tube?
- (iii) Why is there no menstruation upon fertilisation?

3

- (22) Few gaps have been left in the following table showing certain terms and their meanings. Fill up the gaps. 3

Terms	Meanings
(i) -	Non coding sequence in eukaryotic DNA
(ii) -	Technique used in solving paternity disputes
(iii) Restriction endonuclease	_____
(iv) Plasmid	_____
(v) Transgenics	_____
(vi) -	Nucleotide sequences with single base differences

- (23) A <sub>3'</sub> \_\_\_\_\_ <sub>5'</sub> B 3  
 C <sub>5'</sub> \_\_\_\_\_ <sub>3'</sub> D

AB and CD represent two strands of a DNA molecule.

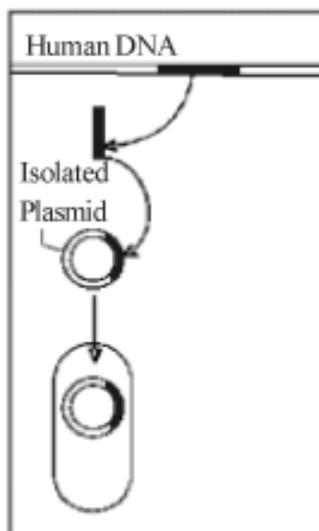
When this molecule undergoes replication, forming a replication fork between A and C in the above.

- (i) Name the template strands for replication.
  - (ii) Using which strand as the template, will there be continuous synthesis of a complementary DNA strand?
  - (iii) Complementary to which strand will okazaki segments get synthesised discontinuous synthesis will occur.
  - (iv) What are template strands and Okazaki pieces?
  - (v) In which direction is a new strand synthesised?
- (24) "A population has been exhibiting genetic equilibrium". 3  
 Answer the following with regard to the above statement.
- (i) Explain the above statement.
  - (ii) Name the underlying principle.
  - (iii) List any two factors which would upset the genetic equilibrium of the population.
  - (iv) Take up any one such factor and explain how the gene pool will change due to that factor

**OR**

In the 1950s, there were hardly any mosquitoes in Delhi. The use of the pesticide DDT on standing water killed their larvae. It is believed that now there are mosquitoes because they evolved DDT resistance through the interaction of mutation and Natural Selection. Pointwise, state in a sequence how that could have happened. 3

- (25) A thalassemic child needed repeated blood transfusions got infected by HIV. 3
- (i) Use a rough diagrammatic sketch and arrows to show how the virus increased in number.
  - (ii) Why did the increased number of the HIV virus deteriorate the child's immunity?
  - (iii) Which diagnostic test showed that the infective virus was HIV?
- (26) Microbes play a dual role when used for sewage treatment as they not only help to retrieve usable water but also generate fuel. Write in points how this happens? 3
- (27) Name the particular technique in Biotechnology whose steps are shown in the figure, Use the figure to summarise the technique in three steps.



**SECTION - D**

(28) With an example, explain how biotechnology has been applied in each of the following:

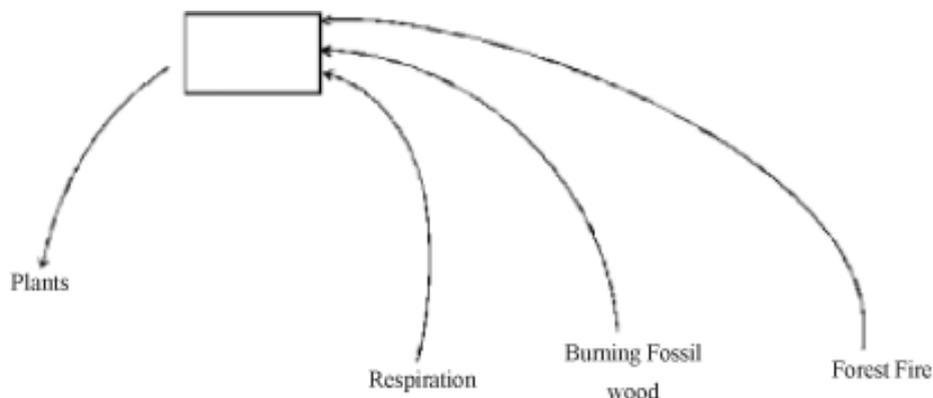
- (i) In curing Diabetes mellitus
- (ii) In raising pest resistant plants
- (iii) In producing more nutritionally balanced milk.

Do you think it is ethical to manipulate organisms for human benefits? Justify your answer.

**OR**

Name any two cloning vectors. Describe the features required to facilitate cloning into a vector.5

(29)



The above diagram shows a simplified biogeochemical cycle

- (i) Name the compound whose cycle is depicted.
- (ii) In what way do vehicles add this compound to the atmosphere?
- (iii) What adverse effect does its excess have on the environment?
- (iv) Cite an event which depicts this effect in the modern times.
- (v) Suggest two ways of reducing this effect.

**OR**

Create an aquatic food chain in a water body into which effluents flow from a pesticide factory. Diagrammatically represent biomagnification in this food chain.

Explain why a decline in the predator-bird population is expected, when it feeds on the tertiary consumers of this food chain. 5

- (30) Study the following carefully and explain why mutation (A) did not cause any sickle cell anemia in spite of change in the molecular structure of the gene which codes for Haemoglobin, when as a similar mutation (B) did. (The question is based on properties of the genetic code. c = codon, a = amino acid, Hb = Haemoglobin)

Codons for Hb : C<sub>1</sub>-C<sub>2</sub>-C<sub>3</sub>-C<sub>4</sub>-C<sub>5</sub>-GAA-GAA-C<sub>8</sub> .....  
Amino acids in Hb : a<sub>1</sub>-a<sub>2</sub>-a<sub>3</sub>-a<sub>4</sub>-a<sub>5</sub>-Glutamic acid -Glutamic acid-a<sub>8</sub> .....  
(Normal Haemoglobin)

Mutation (A) : C<sub>1</sub>-C<sub>2</sub>-C<sub>3</sub>-C<sub>4</sub>-C<sub>5</sub>-GAA-GAA-C<sub>8</sub> .....  
a<sub>1</sub>-a<sub>2</sub>-a<sub>3</sub>-a<sub>4</sub>-a<sub>5</sub>-Glutamic acid -Glutamic acid-a<sub>8</sub> .....  
(Normal Haemoglobin)

Mutation (B) : C<sub>1</sub>-C<sub>2</sub>-C<sub>3</sub>-C<sub>4</sub>-C<sub>5</sub>-GUG-GAA-C<sub>8</sub> .....  
a<sub>1</sub>-a<sub>2</sub>-a<sub>3</sub>-a<sub>4</sub>-a<sub>5</sub>-Valine-Glutamic acid -a<sub>8</sub> .....  
(Sickle cell Haemoglobin) 5

**OR**

One chromosome contains one molecule of DNA. In eukaryotes the length of the DNA molecule is enormously large. Explain how such a long molecule fits into the tiny chromosomes seen at Metaphase.

5

## Marking Scheme

### Sample Paper II

#### XII - Biology

Q. No.	Value Points	Marks
1.	Through asexual reproduction/ parthenogenesis	1
2.	Correctly labelled pericarp and seed.	( $\frac{1}{2} \times 2$ ) = 1
3.	The law of segregation; The factors or alleles present in pairs segregate during gamete formation/ or similar worded.	1
4.	Autosomal dominant; defective trait in both male and female progeny/unaffected child did not pass down trait.	1
5.	Ringworm: <i>Ascaris</i> ; Because ringworm is a disease caused by a fungus (or named fungus) <i>Ascaris</i> causes Ascariasis.	1
6.	Predator-prey/Predation between level (1) and (2); Producer-consumer between levels (3) and (4)	( $\frac{1}{2} \times 2$ ) = 1
7.	Plasmid made of DNA/Deoxy ribonucleic acid; Replicates/duplicates along with host bacterial DNA	( $\frac{1}{2} \times 2$ ) = 1
8.	Polymerase chain reaction; <i>Bacillus thuringiensis</i> (no mark if specific name written with capital T)	( $\frac{1}{2} \times 2$ ) = 1
9.	(i) a = Unlimited food and space, B = limited food and space (ii) curve a, K/carrying capacity $\frac{1}{2} \times 4 = 2$	
10.	(1) RNA polymerase; (2) hn; (3) m; (4) poly A tail	$\frac{1}{2} \times 4 = 2$
10.	Replication; Eukaryotic transcription; translation; gene regulation	( $\frac{1}{2} \times 4$ ) = 2
11.	Individual = age; population = Natality; community= predator-prey relation; ecosystem = energy flow	( $\frac{1}{2} \times 4$ ) = 2
12.	A - Sporogenous tissue; form microspores or pollen grains. B - Tapetum; nourishes the developing pollen grains.	
13.	Barrier = Diaphragm/ condom/cervical cap 1UD = Copper T Surgical technique = Vasectomy / Tubectomy Hormonal administrations = Oral pill/saheli	( $\frac{1}{2} \times 4$ ) = 2
14.	(i) Microspore mother cell = 16; diploid/ 2n (ii) Endosperm cell = Triploid / 3n	( $\frac{1}{2} \times 4$ ) = 2
15.	(A) Insects/arthropods; aerial/air/ground/ soil/ water etc. (B) = fishes/pisces; aquatic/ water/ sea/river etc.	
16.	Phytoplankton; zooplankton; aquatic/water ecosystem showing pyramid of biomass	( $\frac{1}{2} + \frac{1}{2} + 1$ ) = 2
17.	Plant breeding; high yield and pest resistant/drought resistant etc (any two) for increase in food production; green revolution; M.S. Swaminathan	( $\frac{1}{2} \times 4$ ) = 2

18. BOD test measures rate of uptake of  $O_2$  microorganisms in a sample of water. Greater the BOD of water, more is pollution =1

Sample 'C' is most polluted because it has highest BOD level among the three samples of water = 1

$$1 + 1 = 2$$

19. Biofertilisers = organisms enriching nutrient quality of soil; fertilisers = chemical synthesised in factory; Rhizo-bium has symbiotic association with leguminous roots and fixes nitrogen  $1 \times 3 = 3$

20. Label 1 : Origin of plumule; plumule grows into shoot

Label 2 : Cotyledons; food storage

Label 3 : Origin of radicle ; radicle grows into root  $(\frac{1}{2} \times 6) = 3$

21. (i) FSH and LH : high and progesterone low;

FSH and LH : Low and Progesterone high;

(ii) Luteal phase (iii) uterine wall and blood vessels help maintain implanted embryo;

$$\frac{1}{2} + \frac{1}{2} + 1 + 1 = 3$$

22. Intron; DNA finger printing; cuts specific nucleotide sequence; extrachromosomal DNA in bacteria/ vector; modified organisms/ organisms with foreign gene; SNP  $(\frac{1}{2} \times 6) = 3$

23. (i) AB, CD (ii) AB (iii) CD;

Template strands : parental DNA strands complementary to which new strands of DNA are synthesised;

5' - 3' ; small pieces of DNA complementary to template.  $(\frac{1}{2} \times 6) = 3$

24. (i) Allelic frequencies in the gene pool of a population remains unchanged for generations;

(ii) Hardy-Weinberg equilibrium

(iii) Any two factors - mutation/Natural selection : gene flow/genetic drift/ migration

(iv) Mutation : changes alleles/ Natural selection : brings about greater reproduction of certain/ alleles gene flow. migration genetic drift : alleles move out of gene pool  $(\frac{1}{2} \times 6 = 3)$

### OR

Certain larvae born with mutation; which conferred resistance to DDT; DDT sensitive larvae died; DDT resistant larvae completed life history and became adult mosquitoes; natural selection caused greater reproduction of DDT resistant mosquitoes; which soon replaced DDT sensitive mosquitoes.  $(\frac{1}{2} \times 6) = 3$

25. (i) simplified (virus replicated in host cell, many viruses , infect new cell)

(ii) Viral DNA enters helper T-lymphocytes, which are responsible for immunity; virus replicates and attacks other T- lymphocytes whose - number decreases.

(iii) ELISA test /Enzyme linked immunosorbent assay.  $( 1 + 1 + 1) = 3$

26. Heterotrophic microbes naturally present in sewage are used; vigorous growth of aerobic microbes as flocs use up organic matter in effluent and reduce BOD of waste water; other kinds of bacteria grow in it anaerobically; and digest the bacteria and fungi called flocs (masses of bacteria associated with fungal filaments); As they digest flocs a mixture of  $CH_4$ ,  $H_2S$ , and  $CO_2$  or biogas are evolved; which can be used as fuel.  $(\frac{1}{2} \times 6) = 3$

27. Genetic engineering/Recombinant DNA technology; segment of DNA removed from human cell and DNA segment incorporated into bacterial plasmid ; Plasmid taken up into bacterial cell which makes protein directed by human DNA. (1 + 1 + 1) = 3

28. (i) Page 211 production of insulin to cure Diabetes mellitus or gene therapy for cure of ADA  
(ii) Page 209 - using *Agrobacterium* vectors to introduce nematode specific genes or RNAi  
(iii) Page 213- generating transgenic cow such as Rosie. (1 x 5) = 5

Ethical standards required as genetically manipulated organisms may harm other organisms/results unpredictable.

**OR**

Cloning vectors - (i) plasmids, (ii) bacteriophages (iii) YACS, (iv) BACS (any two) 1

Features required to facilitate cloning into a vector are (1 x 4) = 4

- (a) Origin of replication (ori) - Sequence where replication starts and any piece of DNA when linked to this sequence can be made to replicate within host cells.  
(b) Selectable marker - Helps in identifying and eliminating non transformants and selectively permitting the growth of the transformants.  
(c) Cloning sites : Few or single recognition sites are preferable  
(d) Vectors for cloning genes in plants and animals. eg genetically modified *Agrobacterium tumifaciens* and retroviruses.
29. (i) CO<sub>2</sub>  
(ii) Fuels burnt in vehicles emit CO<sub>2</sub> which goes into atmosphere  
(iii) Causes global warming  
(iv) Long summer/ Himalayan caps melting/floods etc.  
(v) Plant more trees/Afforestation/ car pool/ any other (any two) 1 x 4 + ½ x 2 = 5

30. - Genetic code degenerate i.e more than one code for one amino acid.  
- Both GAG, GAA code for glutamic acid.  
- Mutation of third base/ nucleotide- no change in phenotype in mutation A/Wobble hypothesis  
- In case of change on 2<sup>nd</sup> codon of triplet code as in Mutation B, codon stands for a different amino acid valine.  
- Hb becomes different / normal Hb becomes Hbs/Structure of protein changed. (1 x 5) = 5

**OR**

DNA is packaged in the cell in the following manner:

- (a) As Nucleosomes consists of Histone octamer around which the positively charged DNA is wrapped around to form a nucleosome. A typical nucleosome contains 200bp of DNA helix.  
(b) Repeated units of nucleosomes then form chromatin (in a nucleus). The nucleosomes represent the “Beads on String” structure” as seen in electron microscopic picture.  
(c) These are then further coiled and condensed at metaphase stage to form chromosomes.  
(d) For packaging of chromatin at higher level, non histone proteins are required. 5



Fish - eating birds  
(DDT 5 ppm)

Correct food chain - 1  
correct doses of DDT - 1



High conc. of DDT disturbs  
Ca (Calcium) metabolism in birds - 1



Large fish  
(DDT 2 ppm)

Thinning of egg shell - 1



Premature breaking of egg shell eventually leads  
to decline in bird population - 1  
(Note : Food chain may be depicted in writing or through  
pictures)



Small fish  
(DDT 0.5 ppm)



Zooplankton  
(DDT 0.04 ppm)



Water  
(DDT 0.003 ppm)

**BLUE PRINT III**  
**BIOLOGY**  
**CLASS XII**

<b>S. No</b>	<b>Type of Questions</b> → ↓ <b>Units</b>	<b>VSA</b> <b>(1 mark)</b>	<b>SA II</b> <b>(2 marks)</b>	<b>SA I</b> <b>(3 marks)</b>	<b>LA</b> <b>(5 marks)</b>	<b>Total</b>
1.	Reproduction	2(2)	6(3)	6(2)	-	14(7)
2.	Genetic and Evolution	2(2)	2(1)	9(3)	5(1)	18(7)
3.	Biology in Human Welfare	1(1)	4(2)	9(3)	-	14(6)
4.	Biotechnology	2(2)	-	3(1)	5(1)	10(4)
5.	Ecology and Environment	1(1)	8(4)	-	5(1)	14(6)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

## SAMPLE PAPER III

### XII - BIOLOGY

Time : 3 Hours

Max. Marks : 70

#### GENERAL INSTRUCTIONS :

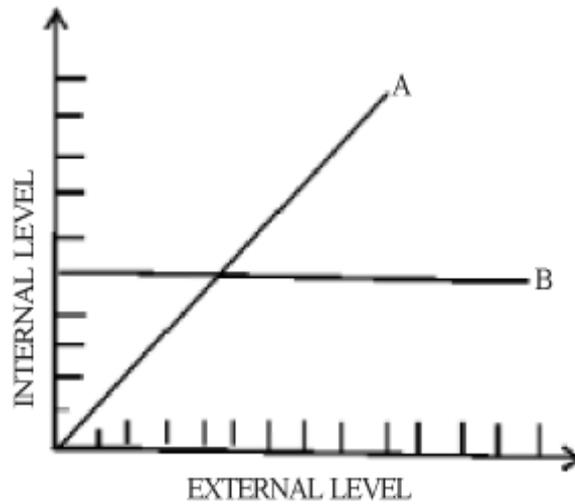
1. All questions are compulsory.
2. The question paper consists of four sections A, B, C and D. Section-A contains 8 questions of 1 mark each, Section B is of 10 questions of 2 marks each, Section C has 9 questions of 3 marks each whereas Section D is of 3 questions of 5 marks each.
3. There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.
4. Wherever necessary, the diagrams drawn should be neat and properly labelled.

#### SECTION - A

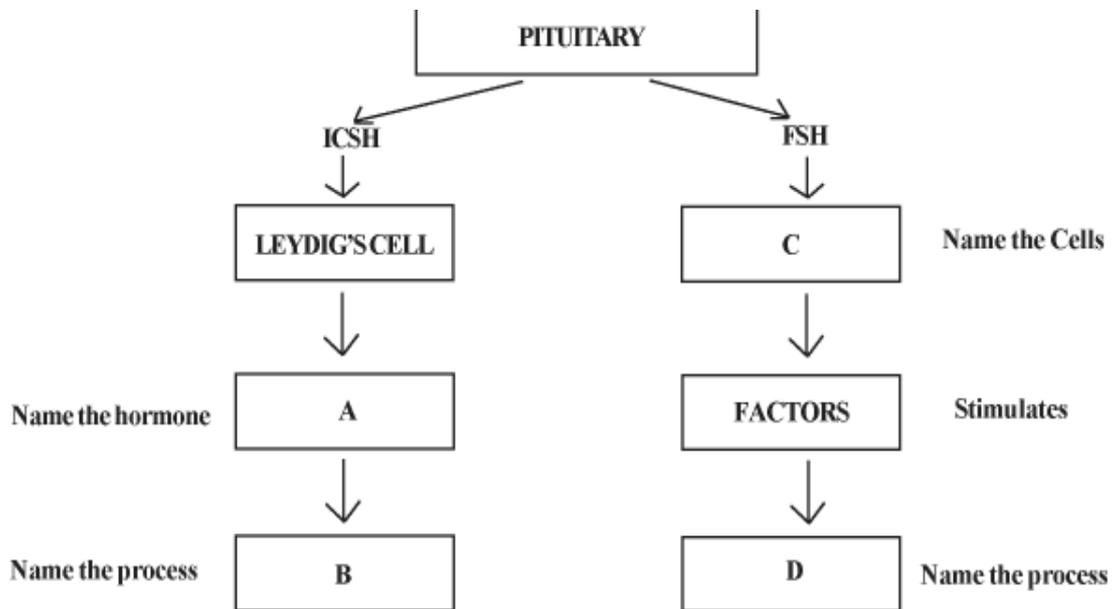
1. Cite an example of an inverted ecological pyramid. What kind of pyramid of energy would it have? 1
2. When is the structure and composition of a community expected to remain unchanged? 1
3. At what stage of life is oogenesis initiated in a human female? When does the oocyte complete oogenesis? 1
4. After a successful in-vitro fertilisation, the fertilised egg begins to divide. Where is this egg transferred before it reaches the 8-cell stage and what is this technique named? 1
5. AaBb was crossed with aabb. What would be the phenotypic ratio of the progeny? Mention the term to denote this kind of cross. 1
6. In F.Griffith's experiment, how did the nonvirulent strain of *Streptococcus Pneumoniae* become virulent?
7. State the use of :
  - (i) *Trichoderma* with respect to organ transplant, and
  - (ii) Nucleopolyhedrovirus with respect to pest management 1
8. Bacteria that convert milk into curd play two other beneficial roles. What are they?

#### SECTION B

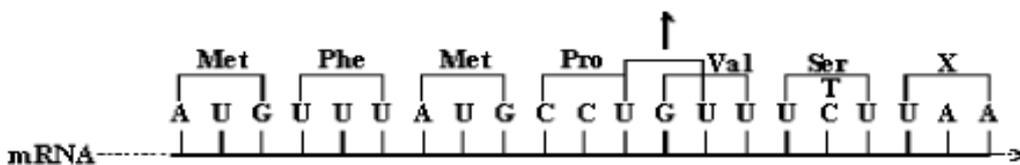
9. Given below is a graph depicting organismic response to changing external conditions. According to their re-sponse the organisms are grouped into two types. Name the type which will show (i) pattern A and (ii) pattern B. 2



10. Given below is an incomplete flow chart showing influence of hormones on gametogenesis in males. Observe the flow chart carefully and fill in the blanks A, B, C, and D 2



11. Read the sequence of the nucleotides in the given segment of mRNA and the respective amino acid sequence in the polypeptide chain.



Polypeptide : met-phe-met-proline-valine-serine

- (i) Provide the triplet of bases (codon) for (a) valine (b) proline
- (ii) Write the nucleotide sequence of the DNA strand from which this mRNA was transcribed
- (iii) What does the last codon of this RNA stand for?

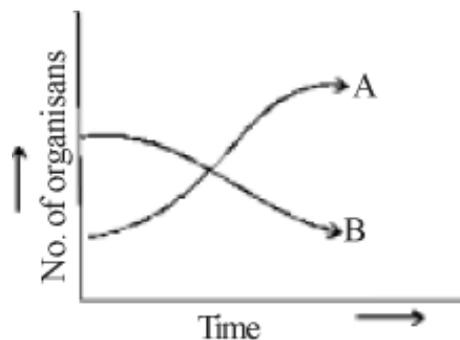
2

OR

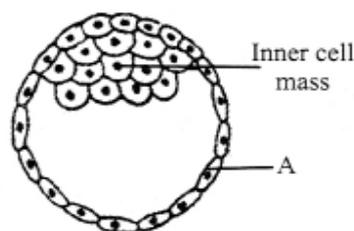
11. The following table shows the genotypes for ABO blood grouping and their phenotypes. Fill in the gaps left in the table 2

S.No.	Genotype	Blood Group
1	$I^A I^A$	A
2	<input type="text"/>	A
3	$I^B I^B$	B
4	<input type="text"/>	B
5	$I^A I^B$	<input type="text"/>
6	<input type="text"/>	O

12. (a) The graph below represents the growth patterns of two types of aquatic organisms over a brief period of time in a water body surrounded by an agricultural land extensively supplied with fertilisers. Identify the organisms that would represent (i) A and (ii) B.
- (b) State the reason for such a change in the water body and also write the term given to it.



13. Study the figure given below and answer the questions that follow:

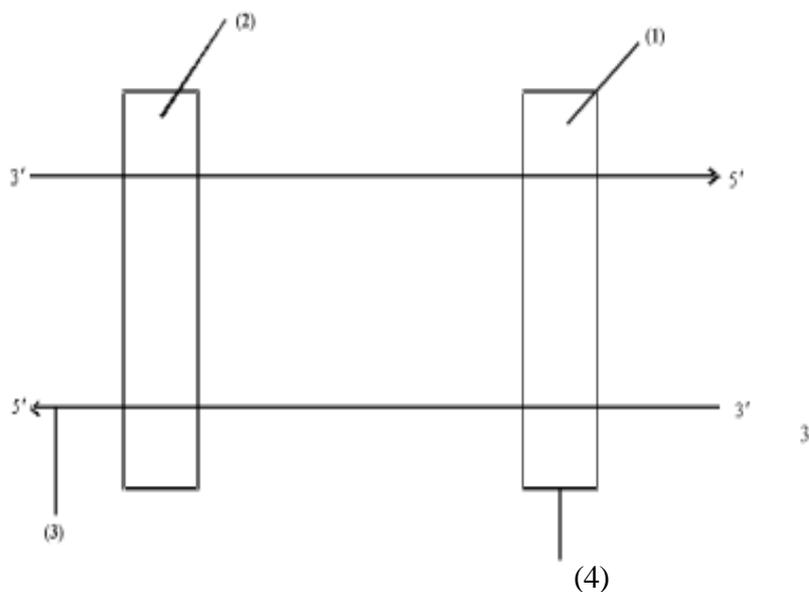


- (a) Name the stage of human embryo the figure represents.
- (b) Identify 'A' in the figure and mention its function.
- (c) Mention the fate of the inner cell mass after implantation in the uterus.
- (d) Where are the stem cells located in this embryo?
14. Following are the steps in MOET programme for herd improvement in which a cow has been administered hormones with FSH like activity. Arrange steps A to D in their correct sequence.
- A - Transferred to a surrogate mother.
- B - It is either mated with an elite bull or artificially inseminated.
- C - Fertilised eggs at 32 cell stage are recovered non surgically.
- D - It produces 6-8 eggs instead of one egg which they normally yield per cycle.

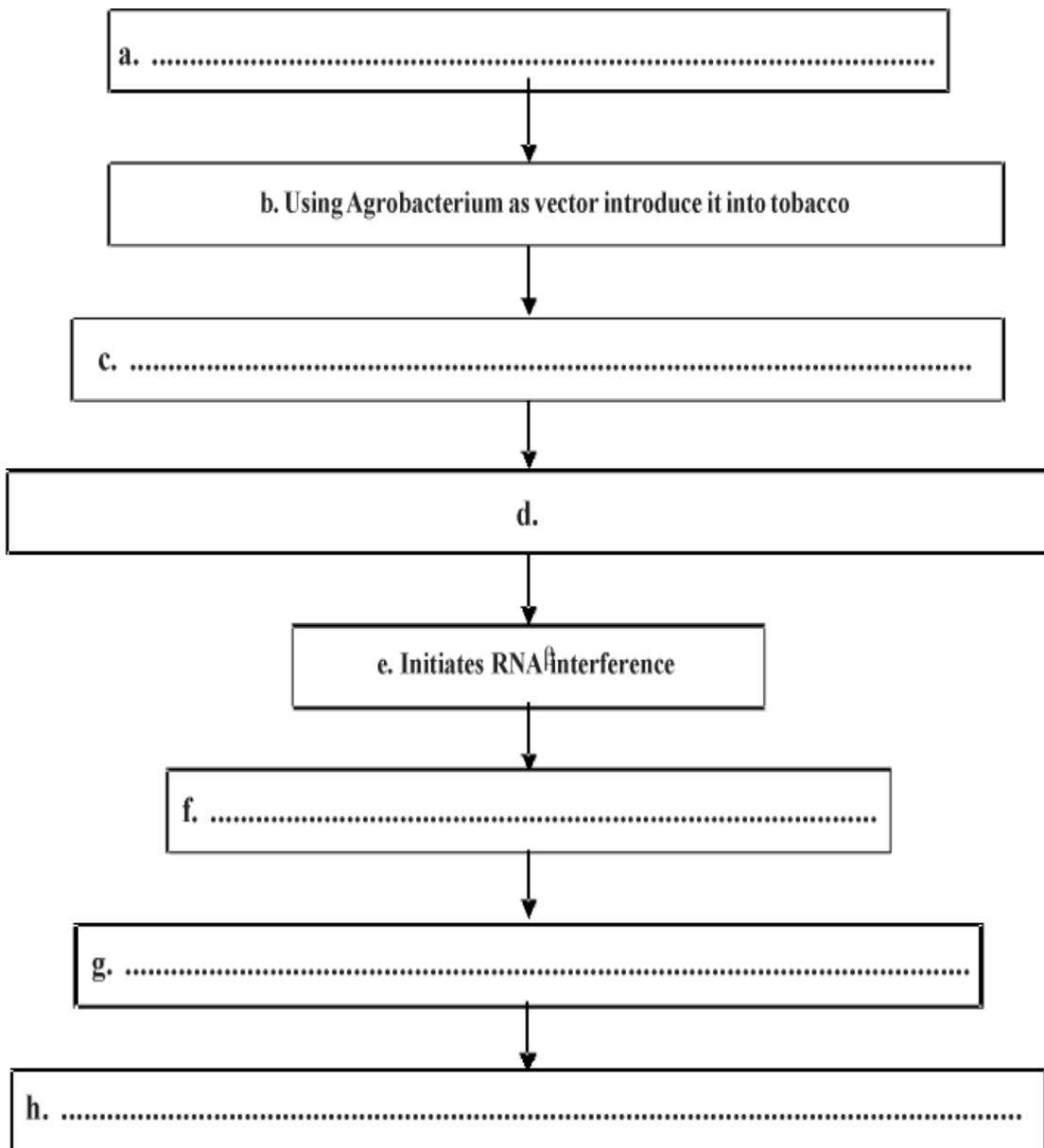
15. (i) In which disease is there an uncontrolled division of cells resulting in formation of tumours? How is this disease detected?  
 (ii) How do interferons help in controlling the disease?
16. State the principle underlying 'gel electrophoresis' and mention two applications of this technique in biotechnology. 2
17. You have developed a GM organism. Which government organisation will you approach to obtain clearance for its mass production? Why is such a body necessary? Give two reasons. 2
18. A person shows a strong immunogenic reactions while exposed to certain substances. Name this condition and common term for such substances. Mention the cell and its chemical which causes this condition.

### SECTION C

19. Amazonian rain forest has the greatest biodiversity on earth. List any two hypotheses that are proposed by the biologists to account for the greater biological diversity. 3
20. (a) In which part of the human female reproductive system do the following events take place?  
 I - Release of 1<sup>st</sup> polar body.  
 II - Release of 2<sup>nd</sup> polar body.  
 III - Fertilisation  
 IV - Implantation
- (b) From where do signals for parturition originate and what does maternal pituitary release for stimulating uterine contractions for child birth? 3
21. A true breeding tall plant is crossed with a true breeding dwarf plant. F<sub>1</sub> progeny is 100% tall and F<sub>2</sub> has tall : dwarf in the ratio 3:1 (i) Explain why F<sub>1</sub> shows only one type of parental phenotype; (ii) Name the patterns of inheritance in which the ratio deviates from above. Also mention the deviated phenotypic ratio. 3
22. In the following diagram the two DNA strands represented are ready for transcription



- (i) Label the parts marked 1 to 4 and state their functions in transcription.
  - (ii) Which one of the two strands of DNA has nucleotide sequence similar to the mRNA that will be transcribed and why?
23. State in what ways Stanley Miller simulated the conditions of :
- (i) Primitive atmosphere on earth.
  - (ii) Energy source at the time of origin of life, and
  - (iii) Formation of organic molecules of life to prove the theory of chemical evolution. 3
24. Draw a flow chart to depict the multiplication of an HIV virus in a host cell. 3
25. What are “flocs”? State their role in effluent treatment and their ultimate fate in sewage treatment tank. 3
26. Two of the steps involved in producing nematode resistant tobacco plants based on the process of RNAi are mentioned below. Write the missing steps in its proper sequence.



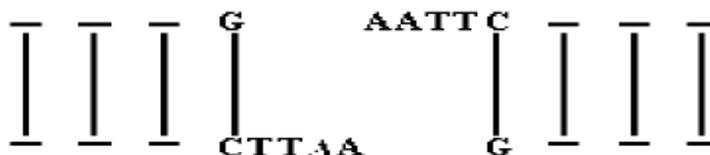
OR

3

27. An interesting property of restriction enzymes is molecular cutting and pasting. Restriction enzymes typically recognize a symmetrical sequence of DNA.



28. Notice that the top strand is the same as the bottom strand, but reads backward. When the enzyme cuts the strand between G and A, it leaves overhanging chains:



- A. What is this symmetrical sequence of DNA known as?  
 B. What is the significance of these overhanging chains?  
 C. Name the restriction enzyme that cuts the strand between G and A 3

#### SECTION D

28. (i) A decade back, the enormous vehicular traffic in Delhi had made Delhi rank 4<sup>th</sup> among polluted cities of the world. Two measures taken by the Delhi Government brought marked improvement in air quality by 2005. What were these two measures and how did they reduce air pollution? 3
- (ii) What is the norm set by Euro II for petrol and diesel vehicles?

**OR**

How is the “sixth episode of extinction” of species on earth, now currently in progress, different from the five earlier episodes? What is it due to? Explain the various causes that have brought about this difference.

29. (a) Draw the embryo sac of a flowering plant and label (i) central cell (ii) Chalazal end of the embryo sac (iii) synergids.
- (b) Name the cell that develops into the embryo sac and explain how this cell leads to the formation of Embryo sac. Also mention the role played by the various cells of the embryo sac. 5

**OR**

Show diagrammatically the stages of embryonic development from zygote upto implantation in humans. 5

30. Name the genes that constitute an operon. How does lac operon get switched on in the presence of lactose? 5

**OR**

With the advent of rDNA technology a powerful tool is available to identify a criminal or to the real parents. Name this technique. Write the missing steps in the procedure given below. There of three steps are mentioned in the flow chart: Extraction of DNA from the cells - (ii).....→(iii) DNA is cut into fragments by restriction enzymes → (iv).....→ (v).....→ (vi).....→ (vii) Autoradiography. ....→ (viii).....→ 5

**Marking Scheme  
Sample Paper-III  
XII - Biology**

- |     |  |  |
|-----|--|--|
| 1.  | Sea/Forest/Large tree<br>Upright   | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 2.  | When the environment remains unchanged   | 1  |
| 3.  | Embryonic life<br>When the sperm enters the egg/at the time of fertilization   | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 4.  | Fallopian tube/oviduct; ZIFT/zygote intra fallopian transfer   | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 5.  | 1 : 1 : 1 : 1 ; ; Test cross   | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 6.  | Bacterial transformation/transfer of genetic material/by acquiring genes for smooth coat   | 1  |
| 7.  | a: Trichoderma - Biocontrol agent of several plant pathogens/ produces Cyclosporin A which is used as an immunosuppressive agent in organ transplant patients  |  |
|     | b. Nucleopolyhedrovirus - Narrow spectrum insecticide  | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 8.  | Increase in nutritional quality/Vitamin B <sub>12</sub> check disease causing microbes in the stomach  | $\frac{1}{2} + \frac{1}{2} = 1$                                      |
| 9.  | A. Conformers<br>B. Regulators   | 1+1 = 2  |
| 10. | A. Androgen/Testosterone/male hormone<br>B. Spermatogenesis<br>C. Sertoli Cells<br>D. Spermiogenesis   | $\frac{1}{2} \times 4 = 2$   |
|     | Stop marking at incorrect entry  |  |
| 11. | (a) (i) GUU<br>(b) (i) CCU<br>(ii) TACAAATACGGACAAAGAATT<br>(iii) UAA stands as stop signal.   | $\frac{1}{2} \times 4 = 2$   |
|     | I <sup>A</sup> i A Blood group<br>I <sup>B</sup> i - B blood group   | I <sup>A</sup> I <sup>B</sup> - AB blood group<br>ii - O Blood group |
| 12. | (A) i. Water Hyacinth/ Algal growth<br>ii. Fish/ Aquatic animals<br>(B) i. Excessive growth of algae triggered by nitrates and phosphates from agricultural land run off water.<br>ii. Algal bloom/ Eutrophication | $\frac{1}{2} \times 4 = 2$   |

13. (a) Blastocyst.  
 (b) Trophoblast. It helps in attachment of the blastocyst to the endometrium of uterine wall.  
 (c) The inner cell mass gets differentiated as the embryo.  
 (d) The inner cell mass contains certain cells called stem cells which have the potency to give rise to all the tissues and organs.
14. It produces 6-8 eggs instead of one egg which they normally yield per cycle It is either mated with an elite bull or artificially inseminated 1/2 x 4  
 Fertilised eggs at 32 cell stage are recovered non - surgically Transferred to surrogate mothers
15. (a) Cancer ; Radiography / Computerised Tomography / Magnetic Resonance Imaging/ any other correct ones 1/2 x 4  
 (b) Activate the immune system and help in destroying the cancer cells
16. (a) Technique where charged molecules are separated on their molecular weight, Gel acts as a sieve. 1/2 x 4  
 (b) DNA fingerprinting / Cloning of rDNA / any other correct two points
17. i. GEAC - Genetic Engineering Approval Committee  
 ii. Makes decisions regarding validity of GM research; checks safety of introducing GM-organisms for public services. may harm living organisms. GMO has unpredictable results 1/2 x 4
18. Allergy  
 Allergens  
 Mast Cells  
 Histamine / Serotonin 1/2 x 4
19. It is a tropical rain forest  
 A. Speciation is a function of time, unlike temperate regions, tropics have remained relatively undisturbed for millions of years and thus had long evolutionary time for species diversification.  
 B. Tropical environments are more constant, predictable and less seasonal. Variations Such constant environments promote niche specialisation and lead to a greater diversity 1 1/2 x 2  
 C. More solar energy available - higher productivity - greater diversity (Any two hypotheses)
20. (a) i. In the ovary  
 ii. In the isthmus - ampullary junction of Fallopian tube  
 iii. Same as (ii) 1/2 x 4  
 iv. In the uterus  
 (b) fully developed foetus and placenta; Oxytocin/Pitocin
21. (a) Case of dominance where allele T is dominant over allele t that is both heterozygous and homozygous dominant express the dominant trait.  
 (b) Case of incomplete dominance 1 : 2 : 1/ Co-dominance 1 : 2 : 1 1 1/2 + 1/2

22. (i) 1. Template strand  
 2. Promoter ½ x 4 = 2  
 3. Coding strand  
 4. Terminator
- (ii) Coding strand because both mRNA and the coding strand are complementary to template strand. 1
23. (i) In a closed flask containing NH<sub>3</sub>, CH<sub>4</sub>, H<sub>2</sub> and Water Vapour to simulate primitive atmosphere  
 (ii) Electric discharge to simulate on primitive earth  
 (iii) Formation of compounds like amino acids from simple molecules like NH<sub>3</sub>, CH<sub>4</sub>, H<sub>2</sub> 1 x 3
24. a. HIV enters the macrophage (human cell)  
 b. Viral RNA genome replicates into DNA with the help of reverse transcription  
 c. Viral DNA is incorporated into host DNA  
 d. Viral DNA directs infected cell to produce viral particles  
 e. Virus comes out while infected cell continues producing HIV particles  
 f. New HIV particles infect Helper T cells which lead to decrease in Helper T cells. ½ x 6
25. (a) Masses of aerobic bacteria associated with fungal filaments  
 (b) While growing they consume large amount of organic matter of the effluents reducing BOD  
 (c) When effluent goes to settling tank and flocs are allowed to sediment for activated sludge, they get digested by anaerobic bacteria 1 + 1 + 1
26. (a) Isolate Nematode specific genes  
 (b) Produces sense and antisense RNA in the host cells  
 (c) Being complementary sense and antisense RNA form double stranded RNA (ds RNA)  
 (d) Silence the specific mRNA of the Nematode  
 (e) Parasite cannot survive in the transgenic tobacco host expressing RNAi  
 (f) Thus the transgenic plant tobacco is protected from nematode
26. A. (i) Insertional activation : A recombinant DNA is inserted within the coding sequence of an enzyme -galactosidase, results in inactivation of the enzyme  
 (ii) The bacterial colonies whose plasmids donot have the insert produce blue colour but those with an insert do not produce colour
- B. Simple and easier method of selecting recombinants from non-recombinants.
27. (a) Palindromic nucleotide sequence / Recognition sequence.  
 (b) DNA fragments from two different molecules which have the same kind of sticky ends overhanging chains can be joined together (end to end) by DNA ligases. 1 x 3  
 (c) EcoRI
28. 1. Changing of all buses to run on CNG  
 a. CNG burns most efficiently

- b. Cheaper than petrol or diesel
  - c. Cannot be siphoned off by thieves / adulterated like petrol or diesel
- 2.
- a. Phasing out of old vehicles 1/2 x 8
  - b. use of unleaded petrol / use of low sulphur petrol / diesel 1/2 + 1/2
  - c. Use of catalytic converters in vehicles norms or any other correct two points each
- Euro II
- a. stipulates that sulphur to be controlled at 350 ppm in diesel and 150 ppm in petrol.
  - b. Aromatic hydrocarbons are to be contained at 42% of the concerned fuel.

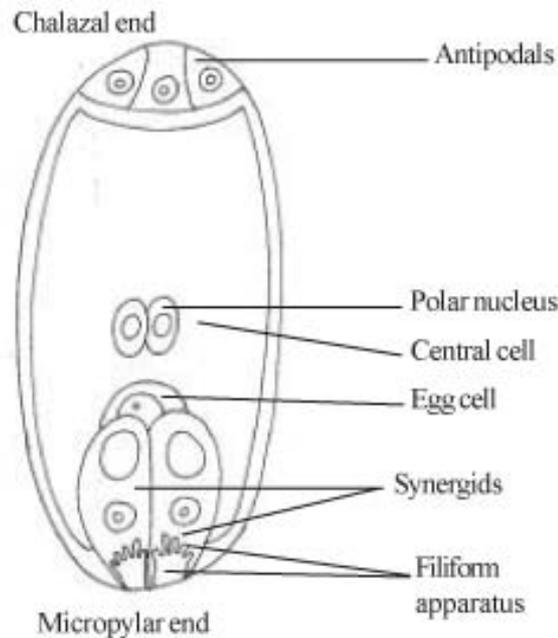
**OR**

- 1. The difference is that 6th episode of extinction is taking place at a 100 to 1000 times faster than the earlier ones. 1/2
- 2. It is largely due to human activities 1/2

The various causes are:

- a. Habitat loss and fragmentation
  - b. Over exploitation
  - c. Introduction / Invasion of alien species
  - d. Co-extinctions
- } 1 × 4 = 4
- 1 + 4 = 5

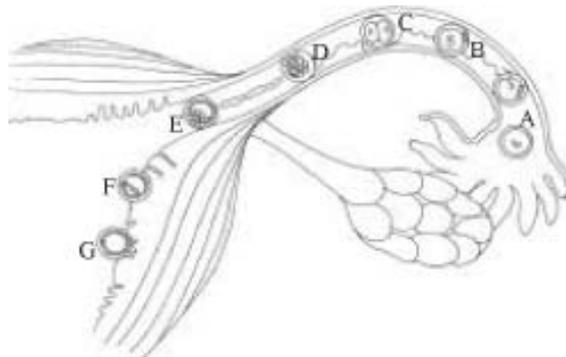
29. (a) Three correct labels



- (b) i. The functional megaspore develops into embryo sac
- ii. Nucleus undergoes mitotic division and the two cells move to the opposite poles

- iii. Two successive mitotic division - an eight nucleate embryo sac 1/2 × 3
- iv. Cell wall formation takes place after nuclear divisions 1/2 × 7
- v. Three cells group together at the micropylar end - egg apparatus with an egg cell and two synergids
- vi. Three cells group together at the chalazal end - antipodal cells
- vii. The remaining two nuclei move to the centre - fuse to form secondary nucleus. 5

**OR**



Zygote ———	A	1/2
Cleavage ———	B 2 celled stage	1/2
	C 4 celled stage	1/2
	D Morula with vitelline membrane	1
	E Blastocyst with trophoblast and inner cell mass	1
	F Implantation of blastocyst	1/2
	G In the endometrium within wall	1/2

30. i. Regulator gene, Promoter gene. Operator gene and structural gene
1. An inducible operon where Lactose is the inducer and it is the substrate for the enzyme B-galactosidase
  2. Three structural genes (z, y, a) which transcribe the polycistronic mRNA
  3. z codes for - galactosidase, y for permease and a for transacetylase
  4. Near the structural genes is the promoter gene where RNA polymerase binds for transcription
  5. An operator gene as a switch near the promoter where a repressor always binds.
  6. Repressor protein coded by the i gene prevents the RNA polymerase from transcribing by binding to the operator
  7. Lactose, an inducer inactivates the repressor and prevents it from binding to the operator.
  8. Allows an access for the RNA polymerase to the promoter
  9. Transcription takes place

10. The substrate lactose regulates the lac-operon.

$\frac{1}{2} \times 10 = 5$

**OR**

DNA finger printing ; (ii) Amplification by polymerase chain reaction

(iv) - Separation of DNA fragments by gel electrophoresis

(v) - Southern blotting

$1 \times 5 = 5$

(vi) - Hybridization using probe fragment

(viii) Matching of DNA fragment photographs and interpretation.