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28.03.2016

Senior School Certificate Examination

March 2016

Marking Scheme - Biology (Theory)

Expected Answers/Value Points

General Instructions :

The Marking Scheme and mechanics of marking

1 In the marking scheme the marking points are separated by commas, one oblique line (/) indicates acceptable alternative, two obliques (//) indicate complete acceptable alternative set of marking points.

2. Any words/phrases given within brackets do not have marks.

3. Allow spelling mistakes unless the misspelt word has another biological meaning. Ignore plurals unless otherwise stated in the marking scheme.

4. In any question exclusively on diagram no marks on any description. But in questions on descriptions, same value points may be marked on the diagrams as a subsitute.

5. All awarded marks are to be written in the left hand margin at the end of the question or its part.

6. Place a tick (✓) in red directly on the key/operative term or idea provided it is in correct context. Place "Half-tick" ½ wherever there is ½ mark in the marking scheme. (Do not place tick indiscriminately just to show that you have read the answer).

7. If no marks are awarded to any part or question put a cross (×) at incorrect value portion and mark it zero (in words only).

8. Add up ticks or the half ticks for a part of the question, do the calculation if any, and write the part total or the question total in the left hand margin.

9. Add part totals of the question and write the question total at the end. Count all the ticks for the entire question as a recheck and draw a circle around the question total to confirm correct addition.

10. If parts have been attempted at different places do the totalling at the end of the part attempted last.

11. If any extra part is attempted or any question is reattempted, score out the last one and write "extra".

12. In questions where only a certain number of items are asked evaluate only that many numbers in sequence as is asked ignoring all the extra ones even if otherwise correct.

13. Transcribe the marks on the cover page. Add up question totals. Recheck the script total by adding up circled marks in the script.

14. Points/answer given in brackets in marking scheme are not so important and may be ignored for marking.

Question Paper Code 57/1

SECTION – A

Q. Nos. 1 - 5 are of one marks each

1. A male honeybee has 16 chromosomes whereas its female has 32 chromosomes. Give one reason.

Ans Male Honey bee develops from unfertilized female gamete / unfertilised egg / Parthenogenesis of female gamete (16 chromosomes), female develops by fertilization / fertilised egg (32 chromosomes) = ½ + ½

[1 Mark]

2. Mention the role of 'genetic mother' in MOET.

Ans Genetic mother is used to produce many eggs / for superovulation // 6-8 eggs (under the influence of FSH)

[1 Mark]

3. What is biopiracy ?

Ans Biopiracy is the use of bioresources by multinational companies and other organization without proper authorization/compensation payment to the concern country /organisation.

[1 Mark]

4. Mention two advantages for preferring CNG over diesel as an automobile fuel.

Ans Advantages of CNG-

i) burns efficiently / less unburnt residues.

ii) Cheaper than petrol / diesel.

iii) Causes less pollution.

iv) cannot be adulterated.

v) cannot be siphoned by thieves. (any two) = ½ × 2

[1 Mark]

5. Write the probable differences in eating habits of *Homo habilis* and *Homo erectus.*

Ans *Homo habilis* did not eat meat / vegetarian

Homo erectus ate meat (meat eater) = ½ × 2

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain.

Ans Pea- flowers of pea plants are bisexual , monoecious / self pollinated (to produce pods with viable seeds) = ½ + ½

Papaya-Dioecious plant / unisexual plant bearing male and female flowers on seperate plants, unable to produce viable seeds as there is no cross pollination / it could be a male plant which is unable to produce fruit and seeds = ½ + ½

[1+1=2 Marks]

7. Following are the features of genetic codes. What does each one indicate ?

Stop codon; Unambiguous codon; Degenerate codon; Universal codon.

Ans Stop codon - does not code for any amino acid / terminates the synthesis of polypeptide chain

Unambiguous codon - one codon codes for one amino acid only

Degenerate codon - some amino acid are coded by more than one codon

Universal codon - genetic code is same for all organisms (bacteria to humans) = ½ ×4

[2 Marks]

8. Suggest four important steps to produce a disease resistant plant through conventional plant breeding technology.

Ans Steps for producing disease resistant plants-

i) Screening of germplasm (for resistance sources)

ii) Hybridization of selected parents

iii) Selection and evaluation of hybrids

iv) Testing and release of new varieties = ½ ×4

[2 Marks]

9. Name a genus of baculovirus. Why are they considered good biocontrol agents ?

Ans Nucleopolyhedrovirus = ½

Species specific, narrow spectrum insecticidal application , no negative impact on non target organisms = ½ ×3

[½ + 1½ = 2 Marks]

10. Explain the relationship between CFC's and Ozone in the stratosphere.

Ans UV rays act on CFC's , release Cl atom ,which act on ozone to release O_2 , resulting in ozone layer depletion / causing ozone hole = ½ ×4

[2 Marks]

OR

Why are sacred groves highly protected ?

Ans Sacred groves are highly protected - because of religious and cultural traditions , refuges for large number of rare and threatened plants / ecologically unique and biodiversity rich regions =1+1

[2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. (a) Name the organic material exine of the pollen grain is made up of. How is this material advantageous to pollen grain ?

(b) Still it is observed that it does not form a continuous layer around the pollen grain. Give reason.

(c) How are 'pollen banks' useful ?

Ans (a) Sporopollenin = ½

Most resistant to high temperature / strong acids / alkali / no enzymes can degrade it **(any one)** = ½

(b) (Germs pores) to allow pollen tube to emerge out / pollen germination = 1

(c) Helps in storing pollen grains for years / for crop breeding programmes = 1

[3 Marks]

OR

(a) Mention the problems that are taken care of by Reproduction and Child Health Care programme.

(b) What is amniocentesis and why there is a statutory ban on it ?

Ans (a) Uncontrolled population growth / social evil like sex abuse / sex related crime / STDs **(any two)** = ½ × 2

(b) Foetal sex determination tests based on chromosomal pattern in the amniotic fluid / to study chromosomal abnormalities in the foetus = 1

Banned to legally check female foeticide =1

[3 Marks]

12. What is a test cross ? How can it decipher the heterozygosity of a plant ?

Ans. - A cross to analyse whether genotype of dominant individual is homozygous or heterozygous =1

- On crossing with a recessive parent , if 50% of progeny have dominant trait and 50% have recessive trait then the plant is said to be heterozygous = 1+1

//

The above value points can be considered with the help of a test cross = 1 + 1

[3 Marks]

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

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

(c) Expand 'SNPs' identified by scientists in HGP.

Ans. (a) - Y = Yeast = ½

B = Bacterial = ½

- Used as vector for cloning foreign DNA = ½

(b) (<) 2% , (<) 50% = ½ + ½

(c) Single Nucleotide Polymorphism = ½

[3 Marks]

14. Differentiate between homology and analogy. Give one example of each.

Ans.

Homology	Analogy
- Organisms having the same structure developed along different directions due to adaptations / different functions	- Different structures having the same function (in different organisms)
- Result of divergent evolution	- Result of convergent evolution
- Indicates common ancestry	- Does not indicate common ancestry
- Anatomically same structures	- Anatomically different structures
	(Any two difference) = 1 + 1
Example	Example
Forelimbs of whale - bats - cheetah - human //	Wings of butterfly and birds //
Thorns of Bougainvillea - tendrils of cucurbits	Sweet potato and potato
	(Any other correct example) = ½ × 2

[3 Marks]

15. (a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons ? Mention their role.

Ans. (a) The first infection of chicken pox produce a primary response and antibodies are generated against chicken pox virus , subsequent encounter with the same virus elicits a highly intensified secondary response , due to the memory cells formed during the first encounter , active immunity = ½ × 4

(b) Proteins secreted by viral infected cells , which protects non infected cells from viral infection / when α - interferon is given to cancer patient (it activates immune system) , destroys tumour = ½ × 2

[3 Marks]

16. (a) Write the two limitations of traditional breeding technique that led to promotion of micro propagation.

(b) Mention two advantages of micro propagation.

(c) Give two examples where it is commercially adopted.

Ans. (a) Failed to keep pace with demand , failed to provide fast and efficient system of crop improvement = ½ × 2

(b) Large number of plants can be developed in a short duration / production of genetically identical plants / somaclones / healthy plants can be recovered from diseased plants

(Any two) = ½ × 2

(c) Tomato / banana / apple ***(Any two)*** = ½ × 2

[3 Marks]

17. (a) How do organic farmers control pests ? Give two examples.

(b) State the difference in their approach from that of conventional pest control methods.

Ans. (a) Natural predation / biological control = 1

Examples - lady bird used to kill aphids // dragon flies used to kill mosquitoes // *Bacillus thuringiensis* used to kill cotton bollworm / caterpillar / butterfly caterpillar

(Any two) **= ½ + ½**

(b)

Conventional Pest Control	**Organic farming based pest control**
- use of chemical insecticides & pesticides	- No chemical used.
- Harmful to non target organisms	- Not harmful to non target organisms
- Cause environmental pollution	- No adverse impact on environment

(Any two) = ½ × 2

[3 Marks]

18. (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.

(b) Why is the coding sequence of an enzyme (β-galactosidase) a preferred selectable marker in comparison to the ones named above ?

Ans. (a) amp^R / ampicillin resistance genes , tet^R/ tetracycline resistance gene = ½ × 2

They help in identifying and eliminating non-transformants / non recombinants and selectively permitting the growth of the transformants / recombinants = 1

(b) Simpler process / less cumbersome , in the presence of chromogenic substrate recombinants are colourless and non recombinants are blue in colour = ½ × 2

[3 Marks]

19. (a) Why must a cell be made 'competent' in biotechnology experiments ? How does calcium ion help in doing so ?

(b) State the role of 'biolistic gun' in biotechnology experiments.

Ans. (a) - To take up the (hydrophilic) DNA from the external medium = 1

- Divalent calcium ions increase the efficiency of DNA entering the cell through pores in the cell wall = 1

(b) To introduce alien DNA into the plant cell by bombarding them with high velocity microparticles (gold or tungsten coated with DNA) = 1

[3 Marks]

20. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency. Mention two disadvantages of this procedure.

Ans. Functional adenosine deaminase is given to the patient by injection = 1

<u>Disadvantages</u>

- Therapy is not completely curative , periodic infusion of enzyme required = 1 + 1

[3 Marks]

21. Name and explain the type of interaction that exists in mycorrhizae and between cattle egret and cattle.

Ans. - Mutualism = ½

Association between fungi and the root of higher plants , fungus absorbs essential nutrients from the soil and plant provides the fungi with energy yielding carbohydrates (both benefitted) = ½ × 2

- Commensalism = ½

Cattle stir up and flush out insects from the vegetation on which the egret feed , cattle is neither harmed nor benefitted / not effected = ½ × 2

[3 Marks]

22. Differentiate between primary and secondary succession. Provide one example of each.

Ans.

	Primary Succession		**Secondary Succession**
-	It begins with areas where no living organisms ever existed	-	It begins in areas where natural biotic communites have been destroyed
-	Establishment of a biotic community is very slow	-	Establishment of a biotic community is faster = 1 × 2
	Example		**Example**
	Newly cooled lava / bare rocks / newly created ponds or reservoir	-	Abandoned farm lands / burnt or cut forests / lands that have been flooded = ½×2

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) Why in your opinion the female partner is often blamed for such situations in India ? Mention any two values that you as a biology student can promote to check this social evil.

(b) State any two reasons responsible for the cause of infertility.

(c) Suggest a technique that can help the couple to have a child where the problem is with the male partner.

Ans. (a) Female partner is blamed due to social mind set / inequality of sexes / lack of awareness / male dominated society / any other relevent point ***(Any two)*** = ½ × 2

- Awareness to be created that abnormality can occur in both male and females and infertility issues with suitable examples
- Mutual respect towards both the partners in case of the problem and to find the remedy from medical experts instead of visiting quacks
- Educate them to find the reason and not believe in superstitions ***(Any two)*** = ½ × 2

(b) Physical (abnormality in reproductive system) , congenital , immunological or psychological ***(Any two)*** = ½ × 2

(c) Intra cytoplasmic sperm injection (ICSI) / artificial insemination (AI) / Intra uterine insemination (IUI) = 1

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.

(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.

(c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.

(d) Draw a graafian follicle and label antrum and secondary oocyte.

Ans. (a) Menstrual phase occurs when released ovum not fertilised , break down of endometrial lining (of the uterus) and its blood vessel form the liquid that comes out through the vagina , lasts for 3 to 5 days = ½ × 3

Level of ovarian and pituitary hormones fall = ½

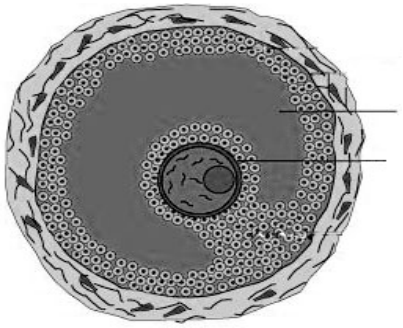
//

graphically represented

(b) Primary follicle grows into graafian follicle under the influence of LH & FSH , regeneration of endometrium (under the influence of estrogen) = ½ × 2

(c) Graafian follicle ruptures to release the ovum (secondary oocyte) , remaining parts of the Graafian follicle transform into corpus luteum = ½ × 2

(d)



[5 Marks]

OR

(a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.

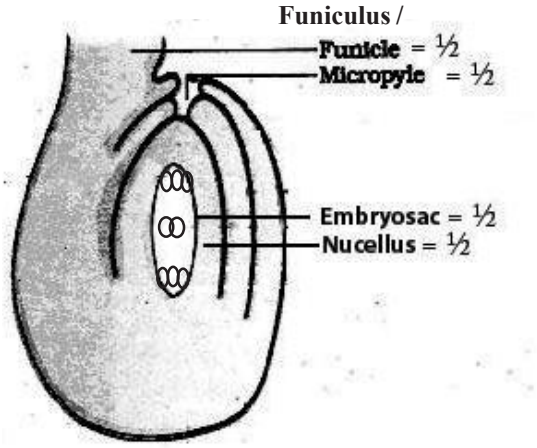
(b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embrvosac and nucellus.

Ans. (a) Emasculation , removal of anthers from the flower bud before the anther dehisce to avoid self pollination = ½ + ½

Bagging , to prevent contamination of its stigma with unwanted pollen grains = ½ + ½

Rebagging , the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop = ½ + ½

(b)

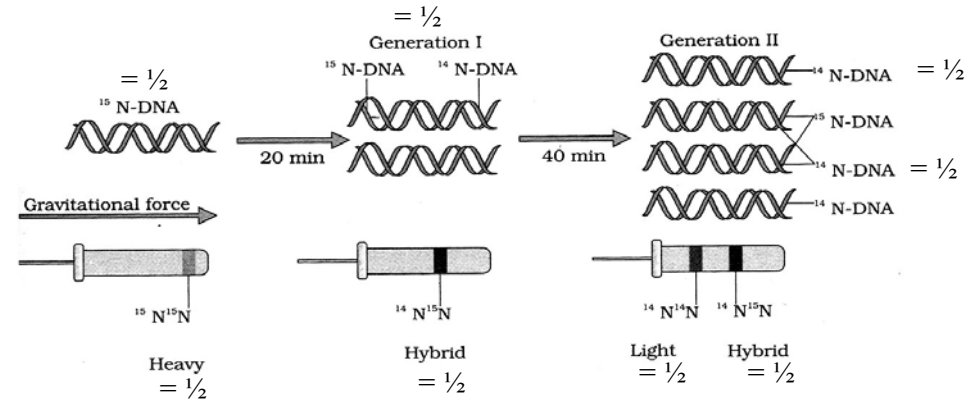


[5 Marks]

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

Ans They grew *E.coli* , in $^{15}NH_4Cl$ for many generations to get ^{15}N incorporated into DNA , then the cells are transferred into $^{14}NH_4Cl$, the extracted DNA are centrifuged in CsCl and measured to get their densities , DNA extracted from the culture after one generation (20 minutes) , showed intermediate hybrid density , DNA extracted after two generations (40 minutes) showed light DNA , and hybrid DNA = ½ × 8 = 4

//



A correctly labelled diagramatic representation in lieu of the explanation of experiment = ½ ×8
DNA replication is semi conservative in nature = 1

OR

(a) Describe the process of transcription in bacteria.

(b) Explain the processing the hnRNA needs to undergo before becoming functional mRNA in eukaryotes.

Ans. (a) Initiation : Enzyme(DNA dependent RNA polymerase)RNA polymerase binds with sigma factor (σ) and attaches to the promoter site ie 5' site of the DNA =1

Elongation : When RNA polymerase moves from promoter to the terminator site it causes the polymerisation of nucleoside triposphates / Nucleotides resulting in the formation of RNA (in

the 5'-3' direction) =1

Termination : RNA Polymerase on reaching the terminator site binds to ρ factor and the (nascent transcribed) RNA falls off along with RNA polymerase =1

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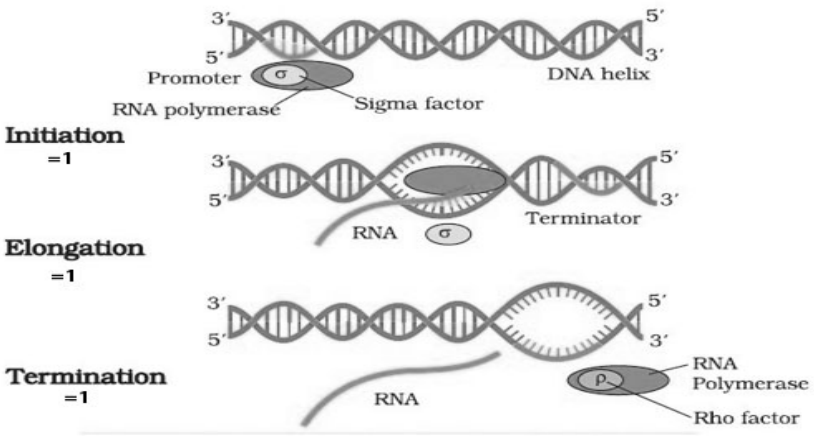
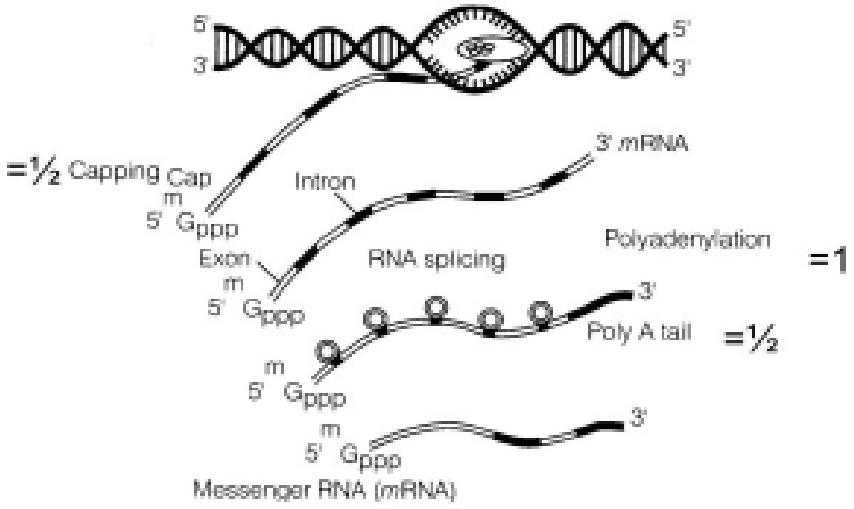


(b) hnRNA undergoes splicing where introns are removed and exons are joined in a defined order = 1

hnRNA undergoes additional processing i.e capping (addition of methyl guanosine triphosphate to the 5'end) , tailing (200-300 poly adenylate residue are added to the 3' end.)

= ½ +½

//



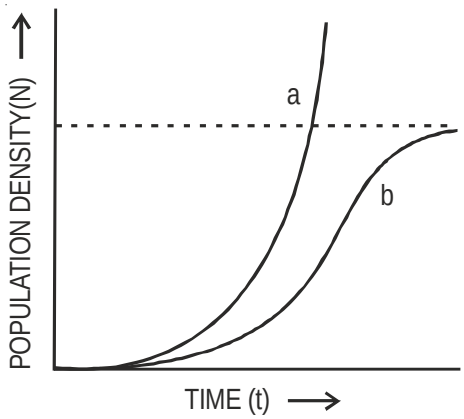
[5 Marks]

26. (a) Name the two growth models that represent population growth and draw the respective growth curves they represent.

(b) State the basis for the difference in the shape of these curves.

(c) Which one of the curves represent the human population growth at present ? Do you think such a curve is sustainable ? Give reason in support of your answer.

Ans (a) Exponental growth curve , logistics growth curve = ½ + ½



= ½ + ½

a - exponential growth curve b - logistic growth curve

(b) Exponential growth - food resources and space unlimited ,

Logistic growth - food resources and space limited = ½ + ½

(c) Exponential growth = 1

not sustainable , as resources are limited / carrying capacity. = ½ + ½

[5 Marks]

OR

(a) Taking an example of a small pond, explain how the four components of an ecosystem function as a unit.

(b) Name the type of food chain that exists in a pond.

(a) Productivity - conversion of inorganic substances into organic material with the help of radiant energy / sunlight by the autotrophs / producers (phytoplankton , algae , floating ,submerged plants) =1

Decomposition - decomposers (fungi , bacteria , flagellates) breakdown dead decayed organic matter into simpler compounds =1

Energy Flow - Unidirectional movement of energy towards higher trophic levels (producer to consumer) and its dissipation and loss as heat to the enviornment =1

Nutrient cycle- Mineralisation of dead matter to release them back for reuse of autotrophs =1

(b) Grazing food chain / detritus food chain =1

[5 Marks]

Question Paper Code 57/2

SECTION – A

Q. Nos. 1 - 5 are of one marks each

1. Write the probable differences in eating habits of *Homo habilis* and *Homo erectus.*

Ans *Homo habilis* did not eat meat / vegetarian

Homo erectus ate meat (meat eater) = ½ × 2

[1 Mark]

2. Mention two advantages for preferring CNG over diesel as an automobile fuel.

Ans Advantages of CNG-

i) burns efficiently / less unburnt residues.

ii) Cheaper than petrol / diesel.

iii) Causes less pollution.

iv) cannot be adulterated.

v) cannot be siphoned by thieves. (any two) = ½ × 2

[1 Mark]

3. A male honeybee has 16 chromosomes whereas its female has 32 chromosomes.

Give one reason.

Ans Male Honey bee develops from unfertilized female gamete / unfertilised egg / Parthenogenesis of female gamete (16 chromosomes), female develops by fertilization / fertilised egg (32 chromosomes) = ½ + ½

[1 mark]

4. Mention two objectives of setting up GEAC by our Government.

Ans Make decisions regarding the validity of GM research , ensure safety of introducing GM organism for public services = ½ ×2

[1 Mark]

5. Mention the role of 'genetic mother' in MOET.

Ans Genetic mother is used to produce many eggs / for superovulation // 6-8 eggs (under the influence of FSH)

[1 Mark]

SECTION - B

Q Nos. 6-10 are of two marks each

6. What is aminoacylation ? State its significance.

Ans Amino acids are activated in the presence of ATP and linked to (cognate) t-RNA = 1

Carries amino acid to the site of protein synthesis / reaches amino acids to the respective codon =1

[2 Marks]

7. Explain the relationship between CFC's and Ozone in the stratosphere.

Ans UV rays act on CFC's , release Cl atom ,which act on ozone to release O_2 , resulting in ozone layer depletion / causing ozone hole = ½ ×4

[2 Marks]

OR

Why are sacred groves highly protected ?

Ans Sacred groves are highly protected - because of religious and cultural traditions , refuges for large number of rare and threatened plants / ecologically unique and biodiversity rich regions =1+1

[2 Marks]

8. Gynoecium of a flower may be apocarpous or syncarpous. Explain with the help of an example each.

Ans Carpels are free (apocarpous) , Eg Michelia = ½ ×2

Carpels are fused (syncarpous) , Eg Papaver = ½ ×2

(Any other suitable correct e.g)

[2 Marks]

9. "Large scale cultivation of *spirullina* is highly advantageous for human population." Explain giving two reasons.

Ans Source of good protein fats carbohydrates minerals and Vitamins for undernourished humans and animal population , reduce environmental pollution / can be grown in waste water / molasses / straw / animal manure , easy to cultivate. **(any Two)** = 1 × 2

[2 Marks]

10. Name a genus of baculovirus. Why are they considered good biocontrol agents ?

Ans Nucleopolyhedrovirus = ½

Species specific, narrow spectrum insecticidal application , no negative impact on non target organisms = ½ ×3

[½ + 1½ = 2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

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

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

(c) Expand 'SNPs' identified by scientists in HGP.

Ans. (a) - Y = Yeast = ½

B = Bacterial = ½

- Used as vector for cloning foreign DNA = ½

(b) (<) 2% , (<) 50% = ½ + ½

(c) Single Nucleotide Polymorphism = ½

[3 Marks]

12. Differentiate between divergent and convergent evolution. Give one example of each.

Ans

Divergent	**Convergent**	
- same structure developed along different direction	Different structures evolving for the same function	
- due to adaptation to different needs	- due to adaptation to meet similar needs	
Examples	Examples	=1+1
- Vertebrates heart & brain	- Wing of bird & insects	
- thorn of Bougainvillea and tendrils of cucurbita	- Potato & sweet potato - Eye of Octopus & mammals	
- fore limbs of whales, bat , cheetah , humans.	- Flippers of Penguins & dolphin.	
(any one example)	(any one example)	= ½ × 2

[3 Marks]

13. (a) List any four characteristics of an ideal contraceptive.

(b) Name two intrauterine contraceptive devices that affect the motility of sperms.

Ans (a) User friendly , no side effect , reversible , effective , should not interfere with sexual drive / desire of the user, easily available **(any four)** = ½ × 4

(b) copper T / copper 7 / Multiload 375 **(any two)** = ½ × 2

[3 Marks]

OR

(a) How does a farmer use the dormancy of seeds to his advantage ?

(b) What advantages a seed provides to a plant ?

Ans (a) For storage (dehydration) of seeds to be used as food , to raise the crop in the next season = ½ + ½

(b) Seed formation is more dependable, better adaptive strategy for dispersal to new habitat , hard seeds provide protection to the young embryo , being a product of sexual reproduction they generate new genetic combinations / genetic variations / sufficient food reserve for the young seedling to be nourished = ½ × 4

[3 Marks]

14. (a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons ? Mention their role.

Ans. (a) The first infection of chicken pox produce a primary response and antibodies are generated against chicken pox virus , subsequent encounter with the same virus elicits a highly intensified secondary response , due to the memory cells formed during the first encounter , active immunity = ½ × 4

(b) Proteins secreted by viral infected cells , which protects non infected cells from viral infection / when α - interferon is given to cancer patient (it activates immune system) , destroys tumour = ½ × 2

[3 Marks]

15. (a) Write the two limitations of traditional breeding technique that led to promotion of micro propagation.

(b) Mention two advantages of micro propagation.

(c) Give two examples where it is commercially adopted.

Ans. (a) Failed to keep pace with demand , failed to provide fast and efficient system of crop improvement = ½ × 2

(b) Large number of plants can be developed in a short duration / production of genetically identical plants / somaclones / healthy plants can be recovered from diseased plants

(Any two) = ½ × 2

(c) Tomato / banana / apple ***(Any two)*** = ½ × 2

[3 Marks]

16. Differentiate between primary and secondary succession. Provide one example of each.

Ans.

	Primary Succession		**Secondary Succession**
-	It begins with areas where no living organisms ever existed	-	It begins in areas where natural biotic communites have been destroyed
-	Establishment of a biotic community is very slow	-	Establishment of a biotic community is faster = 1 × 2
	Example		**Example**
	Newly cooled lava / bare rocks / newly created ponds or reservoir	-	Abandoned farm lands / burnt or cut forests / lands that have been flooded = ½×2

[3 Marks]

17. Predation is usually referred to as a detrimental association. State any three positive roles that a predator plays in an ecosystem.

Ans Keeps prey population (phytophagous / herbivores / carnivore) under control , maintenance of ecological balance / maintenance of species diversity , acts as conduit for energy transfer = 1+1+1

[3 Marks]

18. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency. Mention two disadvantages of this procedure.

Ans. Functional adenosine deaminase is given to the patient by injection = 1

Disadvantages

- Therapy is not completely curative , periodic infusion of enzyme required = 1 + 1

[3 Marks]

19. (a) How do organic farmers control pests ? Give two examples.

(b) State the difference in their approach from that of conventional pest control methods.

Ans. (a) Natural predation / biological control = 1

Examples - lady bird used to kill aphids // dragon flies used to kill mosquitoes // *Bacillus thuringiensis* used to kill cotton bollworm / caterpillar / butterfly caterpillar

(Any two) **= ½ + ½**

(b)

Conventional Pest Control	**Organic farming based pest control**
- use of chemical insecticides & pesticides	- No chemical used.
- Harmful to non target organisms	- Not harmful to non target organisms
- Cause environmental pollution	- No adverse impact on environment

(Any two) = ½ × 2

[3 Marks]

20. (a) Why must a cell be made 'competent' in biotechnology experiments ? How does calcium ion help in doing so ?

(b) State the role of 'biolistic gun' in biotechnology experiments.

Ans. (a) - To take up the (hydrophilic) DNA from the external medium = 1

- Divalent calcium ions increase the efficiency of DNA entering the cell through pores in the cell wall = 1

(b) To introduce alien DNA into the plant cell by bombarding them with high velocity microparticles (gold or tungsten coated with DNA) = 1

[3 Marks]

21. (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.

(b) Why is the coding sequence of an enzyme (β-galactosidase) a preferred selectable marker in comparison to the ones named above ?

Ans. (a) amp^R / ampicillin resistance genes , tet^R/ tetracycline resistance gene = ½ × 2

They help in identifying and eliminating non-transformants / non recombinants and selectively permitting the growth of the transformants / recombinants = 1

(b) Simpler process / less cumbersome , in the presence of chromogenic substrate recombinants are colourless and non recombinants are blue in colour = ½ × 2

[3 Marks]

22. What is a test cross ? How can it decipher the heterozygosity of a plant ?

Ans. - A cross to analyse whether genotype of dominant individual is homozygous or heterozygous =1

- On crossing with a recessive parent , if 50% of progeny have dominant trait and 50% have recessive trait then the plant is said to be heterozygous = 1+1

The above value points can be considered with the help of a test cross = 1 + 1

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) Why in your opinion the female partner is often blamed for such situations in India ? Mention any two values that you as a biology student can promote to check this social evil.

(b) State any two reasons responsible for the cause of infertility.

(c) Suggest a technique that can help the couple to have a child where the problem is with the male partner.

Ans. (a) Female partner is blamed due to social mind set / inequality of sexes / lack of awareness / male dominated society / any other relevent point ***(Any two)*** = ½ × 2

- Awareness to be created that abnormality can occur in both male and females and infertility issues with suitable examples
- Mutual respect towards both the partners in case of the problem and to find the remedy from medical experts instead of visiting quacks
- Educate them to find the reason and not believe in superstitions ***(Any two)*** = ½ × 2

(b) Physical (abnormality in reproductive system) , congenital , immunological or psychological ***(Any two)*** = ½ × 2

(c) Intra cytoplasmic sperm injection (ICSI) / artificial insemination (AI) / Intra uterine insemination (IUI) = 1

[4 Marks]

SECTION - E

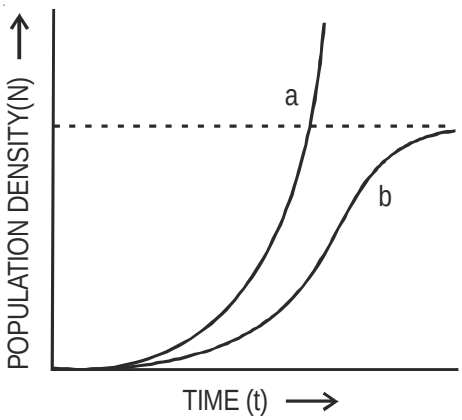
Q Nos. 24-26 are of five marks each

24. (a) Name the two growth models that represent population growth and draw the respec tive growth curves they represent.

(b) State the basis for the difference in the shape of these curves.

(c) Which one of the curves represent the human population growth at present ? Do you think such a curve is sustainable ? Give reason in support of your answer.

Ans (a) Exponental growth curve , logistics growth curve = ½ + ½



= ½ + ½

a - exponential growth curve b - logistic growth curve

(b) Exponential growth - food resources and space unlimited ,

Logistic growth - food resources and space limited = ½ + ½

(c) Exponential growth = 1

not sustainable , as resources are limited / carrying capacity. = ½ + ½

[5 Marks]

OR

(a) Taking an example of a small pond explain how the four components of an ecosystem function as a unit.

(b) Name the type of food chain that exists in a pond.

a) Productivity - conversion of inorganic substances into organic material with the help of radiant energy / sunlight by the autotrophs / producers (phytoplankton , algae , floating ,submerged plants) =1

Decomposition - decomposers (fungi , bacteria , flagellates) breakdown dead decayed organic matter into simpler compounds =1

Energy Flow - Unidirectional movement of energy towards higher trophic levels (producer to consumer) and its dissipation and loss as heat to the enviornment =1

Nutrient cycle- Mineralisation of dead matter to release them back for reuse of autotrophs =1

(b) Grazing food chain / detritus food chain =1

[5 Marks]

25. (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.

(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.

(c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.

(d) Draw a graafian follicle and label antrum and secondary oocyte.

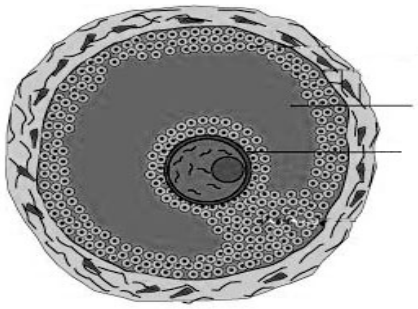
Ans. (a) Menstrual phase occurs when released ovum not fertilised , break down of endometrial lining (of the uterus) and its blood vessel form the liquid that comes out through the vagina , lasts for 3 to 5 days = ½ × 3
Level of ovarian and pituitary hormones fall = ½
//

graphically represented

(b) Primary follicle grows into graafian follicle under the influence of LH & FSH , regeneration of endometrium (under the influence of estrogen) = ½ × 2

(c) Graafian follicle ruptures to release the ovum (secondary oocyte) , remaining parts of the Graafian follicle transform into corpus luteum = ½ × 2

(d)



[5 Marks]

OR

(a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.

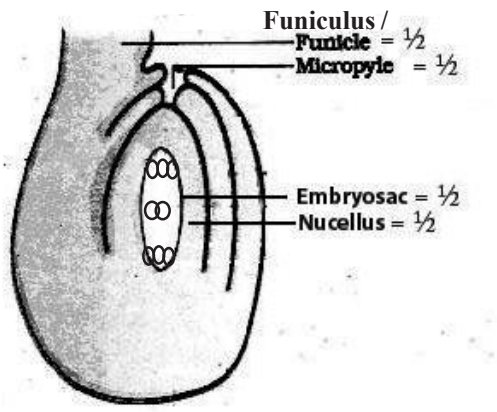
(b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embryosac and nucellus.

Ans. (a) Emasculation , removal of anthers from the flower bud before the anther dehisce to avoid self pollination = ½ + ½

Bagging , to prevent contamination of its stigma with unwanted pollen grains = ½ + ½

Rebagging , the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop = ½ + ½

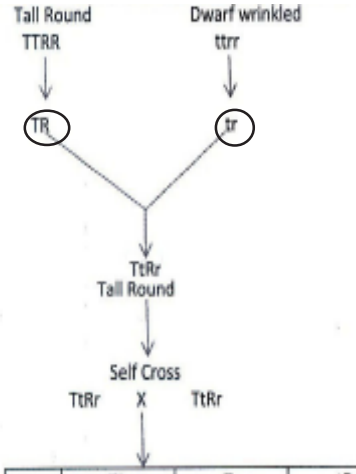
(b)



[5 Marks]

26. Give a genetic explanation for the following cross. When a tall pea plant with round seeds was crossed with a dwarf pea plant with wrinkled seeds then all the individual of F_1-population were tall with round seeds. However selfing among F_1-population led to a 9:3:3:1 phenotypic ratio.

Ans.



/ Parental genotype =½

/ F_1 genotype =½

	TR	Tr	tR	tr
TR	TTRR Tall Round	TTRr Tall Round	TtRR Tall Round	TtRr Tall Round
Tr	TTRr Tall Round	TTrr Tall Wrinkled	TtRr Tall Round	Ttrr Tall Wrinkled
tR	TtRR Tall Round	TtRr Tall Round	ttRR Dwarf round	ttRr Dwarf Round
tr	TtRr Tall Round	Ttrr Tall Wrinkled	ttRr Dwarf round	ttrr Dwarf round

/ Gametes formed to develope F_2 plants = ½

=1

Phenotypic ratio —

Tall Round	Tall Wrinkled	Dwarf Round	Dwarf Wrinkled
9	: 3	: 3	: 1

/ F_2 Phenotype =½

Law of dominance

In a dissimilar pair of factors one member of the pair is dominant and the other is recessive.

In the given cross tall and round are dominant where as dwarf and wrinkled are recessive (explain with or without a cross) = ½

Law of Segregation

Allelic pairs seperate or segregate during gamete formation and the paired condition is restored during fertilisation (explain with or without a cross) = ½

Law of Independent Assortment

The new combination seen in F_2 generation (Tall wrinkled) (Dwarf round) is only possible when the two gene pairs for height and seed shape (assort) independently of each other during gamete formation / The law states that when two pairs of traits are combined in a hybrid segregation of one pair of characters is independent of the other pair of characters =1

[3 +½ +½ +1 = 5 Marks]

OR

(a) Describe the series of experiments of F. Griffith. Comment on the significance of the results obtained.

(b) State the contribution of Macleod, McCarty and Avery.

Ans. (a) *Streptococcus pneumoniae* S - Strain (virulent) injected into mice $\rightarrow$ mice die = ½

R - strain injected into mice $\rightarrow$ mice alive = ½

S - strain (heat killed) injected into mice $\rightarrow$ mice alive = ½

R - strain (alive) + S (heat killed) strain inject into mice $\rightarrow$ mice die = ½

As the R strain (non -virulent) picked up genetic material from S strain (virulent) and get transformed = 1

(b) They (worked on the bio-chemical nature of transforming principle in Griffith's experiment) purified proteins DNA and RNA from heat killed S cells , they discovered protein digesting enzyme(protease)RNA digesting enzyme (RNase) did not affect transformation , Digestion with DNase inhibited transformation , concluded DNA is the heredity material

= ½ × 4

[5 Marks]

Question Paper Code 57/3

SECTION – A

Q. Nos. 1 - 5 are of one marks each

1. Mention two advantages for preferring CNG over diesel as an automobile fuel.

Ans Advantages of CNG-

i) burns efficiently / less unburnt residues.

ii) Cheaper than petrol / diesel.

iii) Causes less pollution.

iv) cannot be adulterated.

v) cannot be siphoned by thieves. (any two) = ½ × 2

[1 Mark]

2. What are transgenic animals. Give an example.

Ans. Animals whose DNA is manipulated to possess and express an extra (foreign) gene

eg. Rosie - transgenic cow

(Any other correct example of animal)

[½ × 2 =1 mark]

3. Write the probable differences in eating habits of *Homo habilis* and *Homo erectus.*

Ans *Homo habilis* did not eat meat / vegetarian

Homo erectus ate meat (meat eater) = ½ × 2

[1 Mark]

4. Mention the role of'genetic mother' in MOET.

Ans Genetic mother is used to produce many eggs / for superovulation // 6-8 eggs (under the influence of FSH)

[1 Mark]

5. A male honeybee has 16 chromosomes whereas its female has 32 chromosomes. Give one reason.

Ans Male Honey bee develops from unfertilized female gamete / unfertilised egg / Parthenogenesis of female gamete (16 chromosomes), female develops by fertilization / fertilised egg (32 chromosomes) = ½ + ½

[1 mark]

SECTION – B

Q Nos. 6-10 are of two marks each

6. Name a free-living and a symbiotic bacterium that serve as bio-fertilizer.Why are they so called ?

Ans. *Azospirillium* / *Azotobacter , Rhizobium* = ½ + ½ **(any other correct example)**

They enrich soil nutrient / nitrogen fixation = 1

[2 marks]

7. Name the cells , HIV (Human Immunodeficiency Virus)gains entry into after infecting the human body. Explain the events that occur in these cells.

Ans. Macrophages , (Helper) T-lymphocytes , viral RNA forms DNA by reverse transcription (reverse transcriptase) , directs the infected cells to produce viral particles / increase viral progeny = ½ × 4

[2 marks]

8. Explain the relationship between CFC's and Ozone in the stratosphere.

Ans UV rays act on CFC's , release Cl atom ,which act on ozone to release O_2 , resulting in ozone layer depletion / causing ozone hole = ½ ×4

[2 Marks]

OR

Why are sacred groves highly protected ?

Ans Sacred groves are highly protected - because of religious and cultural traditions , refuges for large number of rare and threatened plants / ecologically unique and biodiversity rich regions =1+1

[2 Marks]

9. Following are the features of genetic codes. What does each one indicate ? Stop codon; Unambiguous codon; Degenerate codon; Universal codon.

Ans Stop codon - does not code for any amino acid / terminates the synthesis of polypeptide chain

Unambiguous codon - one codon codes for one amino acid only

Degenerate codon - some amino acid are coded by more than one codon

Universal codon - genetic code is same for all organisms (bacteria to humans) = ½ ×4

[2 Marks]

10. Out of many papaya plants growing in your garden,only a few bear fruits Give reason.

Ans. Unisexual / Dioecious // male and female flowers are borne on separate plants , only plants bearing female flowers will bear fruits = 1 + 1

[2 marks]

SECTION – C

Q Nos. 11-22 are of three marks each

11. (a) Write the two limitations of traditional breeding technique that led to promotion of micro propagation.

(b) Mention two advantages of micro propagation.

(c) Give two examples where it is commercially adopted.

Ans. (a) Failed to keep pace with demand , failed to provide fast and efficient system of crop improvement = ½ × 2

(b) Large number of plants can be developed in a short duration / production of genetically identical plants / somaclones / healthy plants can be recovered from diseased plants

(Any two) = ½ × 2

(c) Tomato / banana / apple ***(Any two)*** = ½ × 2

[3 Marks]

12. (a) It is generally observed that the children who had suffered from chicken - pox in their childhood may not contract the same disease in their adulthood. Explain giving reasons the basis of such an immunity in an individual. Name this kind of immunity.

(b) What are interferons ? Mention their role.

Ans. (a) The first infection of chicken pox produce a primary response and antibodies are generated against chicken pox virus , subsequent encounter with the same virus elicits a highly intensified secondary response , due to the memory cells formed during the first encounter , active immunity = ½ × 4

(b) Proteins secreted by viral infected cells , which protects non infected cells from viral infection / when α - interferon is given to cancer patient (it activates immune system) , destroys tumour = ½ × 2

[3 Marks]

13. How do homologous organs represent divergent evolution ? Explain with the help of a suitable example.

Ans. Organs with similar strucuture / same ancestry / anatomically same / same origin developed along different directions due to adapation / different needs , to perform different functions = 1+1

For example the fore limbs of some animals (Vertebrates) like whales , bats , cheetah and human have similar anatomical strucuture (i.e. humerus , radius , ulna, carpals,metacarpals and phalanges) develop differently to meet different needs / to perform different functions (any other correct example) =1

[3 Marks]

14. Name two hormones that are constituents of contraceptive pills. Why do they have high and effective contraceptive value ? Name a commonly prescribed non-steroidal oral pill.

Ans Progestogen-estrogen / Progesterone-estrogen combination , Progestogen / Progesterone = ½ +½

They inhibit ovulation , inhibit implantation , alter quality of cervical mucus to retard entry of sperm =½ × 3

Saheli = ½

[3 Marks]

OR

(a) How are Parthenocarpic fruits produced by some plants and apomictic seeds by some others ? Explain.

(b) When do farmers prefer using apomictic seeds ?

Ans (a) Ovary develops into fruit without fertilisation =1

Formation of seeds without fertilisation / form without reductional divison / develop into embryo without fertilisation =1

(b) To maintain hybrid characters (year after year in a desired plant) , to avoid buying hybrid seeds every year (expensive seeds) = ½ + ½

[3 Marks]

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

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

(c) Expand 'SNPs' identified by scientists in HGP.

Ans. (a) - Y = Yeast = ½

B = Bacterial = ½

- Used as vector for cloning foreign DNA = ½

(b) (<) 2% , (<) 50% = ½ + ½

(c) Single Nucleotide Polymorphism = ½

[3 Marks]

16. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency. Mention two disadvantages of this procedure.

Ans. Functional adenosine deaminase is given to the patient by injection = 1

Disadvantages

- Therapy is not completely curative , periodic infusion of enzyme required = 1 + 1

[3 Marks]

17. What is a test cross ? How can it decipher the heterozygosity of a plant ?

Ans. - A cross to analyse whether genotype of dominant individual is homozygous or heterozygous =1

- On crossing with a recessive parent , if 50% of progeny have dominant trait and 50% have recessive trait then the plant is said to be heterozygous = 1+1

//

The above value points can be considered with the help of a test cross = 1 + 1

[3 Marks]

18. (a) How do organic farmers control pests ? Give two examples.

(b) State the difference in their approach from that of conventional pest control methods.

Ans. (a) Natural predation / biological control = 1

Examples - lady bird used to kill aphids // dragon flies used to kill mosquitoes // *Bacillus thuringiensis* used to kill cotton bollworm / caterpillar / butterfly caterpillar

(Any two) **= ½ + ½**

(b)

Conventional Pest Control	**Organic farming based pest control**
- use of chemical insecticides & pesticides	- No chemical used.
- Harmful to non target organisms	- Not harmful to non target organisms
- Cause environmental pollution	- No adverse impact on environment

(Any two) = ½ × 2

[3 Marks]

19. (a) Name the selectable markers in the cloning vector pBR322 ? Mention the role they play.

(b) Why is the coding sequence of an enzyme (β-galactosidase) a preferred selectable marker in comparison to the ones named above ?

Ans. (a) amp^R / ampicillin resistance genes , tet^R/ tetracycline resistance gene = ½ × 2

They help in identifying and eliminating non-transformants / non recombinants and selectively permitting the growth of the transformants / recombinants = 1

(b) Simpler process / less cumbersome , in the presence of chromogenic substrate recombinants are colourless and non recombinants are blue in colour = ½ × 2

[3 Marks]

20. Differentiate between primary and secondary succession. Provide one example of each.

Ans.

Primary Succession	**Secondary Succession**
- It begins with areas where no living organisms ever existed	- It begins in areas where natural biotic communites have been destroyed
- Establishment of a biotic community is very slow	- Establishment of a biotic community is faster = 1 × 2
Example	**Example**
Newly cooled lava / bare rocks / newly created ponds or reservoir	- Abandoned farm lands / burnt or cut forests / lands that have been flooded = ½×2

[3 Marks]

21. (a) Why must a cell be made 'competent' in biotechnology experiments ? How does calcium ion help in doing so ?

(b) State the role of 'biolistic gun' in biotechnology experiments.

Ans. (a) - To take up the (hydrophilic) DNA from the external medium = 1

- Divalent calcium ions increase the efficiency of DNA entering the cell through pores in the cell wall = 1

(b) To introduce alien DNA into the plant cell by bombarding them with high velocity microparticles (gold or tungsten coated with DNA) = 1

[3 Marks]

22. Explain Parasitism and co-evolution with the help of one example of each.

Ans Mode of interaction between two species in which one species (parasite) depends on the other species (host) for food and shelter / one organism is benefitted , the other is harmed = ½ + ½

e.g Human liver fluke / Malarial parasite / Cuscuta = ½

Co-evolution is the relationship between two interacting organisms where both organisms failed to survive in the absence of the other = 1

e.g Fig and fig wasp / ophrys and bumble bee = ½ **(or any other suitable example)**

[3 Marks]

SECTION – D

Q No. 23 is of four mark

23. A large number of married couples the world over are childless. It is shocking to know that in India the female partner is often blamed for the couple being childless.

(a) Why in your opinion the female partner is often blamed for such situations in India ? Mention any two values that you as a biology student can promote to check this social evil.

(b) State any two reasons responsible for the cause of infertility.

(c) Suggest a technique that can help the couple to have a child where the problem is with the male partner.

Ans. (a) Female partner is blamed due to social mind set / inequality of sexes / lack of awareness / male dominated society / any other relevent point ***(Any two)*** = ½ × 2

- Awareness to be created that abnormality can occur in both male and females and infertility issues with suitable examples
- Mutual respect towards both the partners in case of the problem and to find the remedy from medical experts instead of visiting quacks
- Educate them to find the reason and not believe in superstitions ***(Any two)*** = ½ × 2

(b) Physical (abnormality in reproductive system) , congenital , immunological or psychological ***(Any two)*** = ½ × 2

(c) Intra cytoplasmic sperm injection (ICSI) / artificial insemination (AI) / Intra uterine insemination (IUI) = 1

[4 Marks]

SECTION – E

Q Nos. 24-26 are of five marks each

24. (a) What is polygenic inheritance ? Explain with the help of a suitable example.

(b) How are pleiotropy and Mendelian pattern of inheritance different from polygenic pattern of inheritance ?

Ans (a) Inheritance in which traits are controlled by three or more genes , eg human skin colour / height , the inheritance depends upon the additive / cumulative effect of allelles , more the number of dominant allelles the expression of the trait will be more distinct / prominent , more the number of recessive allelles the trait will be diluted , if member of dominant and recessive allelles are equal the effect is intermediate = ½ × 6

//

same explanation with the help of any suitable example

b) Single gene controls multiple phenotypic expression (Pleiotropy) , one gene controls one phenotypic expression (Mendelian) = 1+ 1

[5 Marks]

OR

(a) Name the stage in the cell cycle where DNA replication occurs.

(b) Explain the mechanism of DNA replication.Highlight the role of enzymes in the process

(c) Why is DNA replication said to be semiconservative ?

Ans (a) S phase / synthetic phase (of interphase) = ½

(b) The replication begins in definite regions which are called the origin of replication ,
Replication occurs within a small opening of the DNA referred to as Y shaped replication fork (uncoiling of DNA is by some enzymes eg Helicase and topoisomerase),
Polymerisation of the nucleotides are catalysed by DNA dependent DNA polymerase in 5' - 3' directions ,
Deoxyribonucleotides act as substrates and also provide energy for the process ,
The new strands formed on 3 '-5' template is continuous ,
New strands formed on 5-'3' template is discontinuous,
The discontinuously formed fragments are joined by enzyme DNA ligase
= ½ × 7

(c) During DNA replication in the two newly synthesised daughter DNA one strand is parental (conserved) and the other is newly synthesised =1

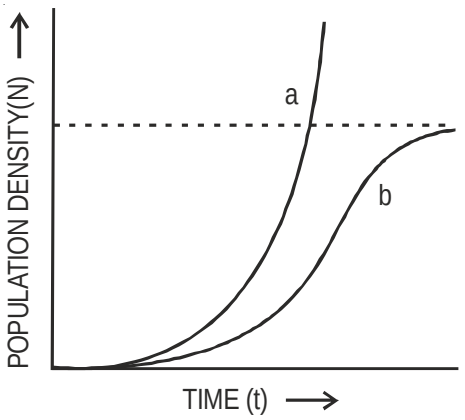
[5 Marks]

25. (a) Name the two growth models that represent population growth and draw the respective growth curves they represent.

(b) State the basis for the difference in the shape of these curves.

(c) Which one of the curves represent the human population growth at present ? Do you think such a curve is sustainable ? Give reason in support of your answer.

Ans (a) Exponental growth curve , logistics growth curve = ½ + ½



= ½ + ½

a - exponential growth curve b - logistic growth curve

(b) Exponential growth - food resources and space unlimited ,

Logistic growth - food resources and space limited = ½ + ½

(c) Exponential growth = 1

not sustainable , as resources are limited / carrying capacity. = ½ + ½

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OR

(a) Taking an example of a small pond, explain how the four components of an ecosystem function as a unit.

(b) Name the type of food chain that exists in a pond.

Ans (a) Productivity - conversion of inorganic substances into organic material with the help of radiant energy / sunlight by the autotrophs / producers (phytoplankton , algae , floating ,submerged plants) =1

Decomposition - decomposers (fungi , bacteria , flagellates) breakdown dead decayed organic matter into simpler compounds =1

Energy Flow - Unidirectional movement of energy towards higher trophic levels (producer to consumer) and its dissipation and loss as heat to the enviornment =1

Nutrient cycle- Mineralisation of dead matter to release them back for reuse of autotrophs =1

(b) Grazing food chain / detritus food chain =1

[5 Marks]

26. (a) Explain the menstrual phase in a human female. State the levels of ovarian and pituitary hormones during this phase.

(b) Why is follicular phase in the menstrual cycle also referred as proliferative phase ? Explain.

(c) Explain the events that occur in a graafian follicle at the time of ovulation and thereafter.

(d) Draw a graafian follicle and label antrum and secondary oocyte.

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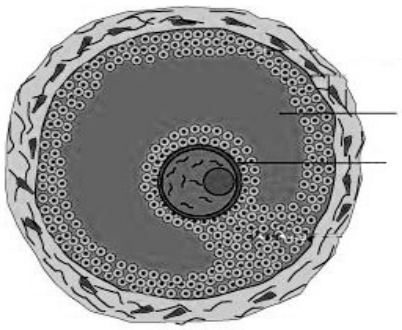
//

graphically represented

(b) Primary follicle grows into graafian follicle under the influence of LH & FSH , regeneration of endometrium (under the influence of estrogen) = ½ × 2

(c) Graafian follicle ruptures to release the ovum (secondary oocyte) , remaining parts of the Graafian follicle transform into corpus luteum = ½ × 2

(d)



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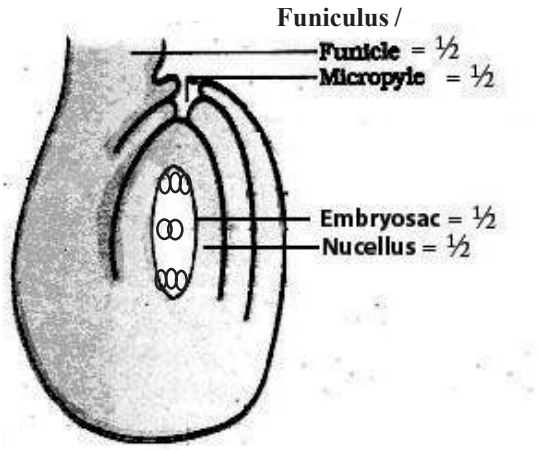
Ans. (a) Emasculation , removal of anthers from the flower bud before the anther dehisce to avoid self pollination = ½ + ½

Bagging , to prevent contamination of its stigma with unwanted pollen grains = ½ + ½

Rebagging , the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop = ½ + ½

(b)



[5 Marks]