BIOLOGY (Theory)

Time allowed : 3 hours ***Maximum Marks : 70***

General Instructions:

*(i) There are a total of **26** questions and **five** sections in the question paper. **All** questions are compulsory.*

*(ii) Section **A** contains question number **1** to **5**, Very Short Answer type questions of **one** mark each.*

*(iii) Section **B** contains question number **6** to **10**, Short Answer type **I** questions of **two** marks each.*

*(iv) Section **C** contains question number **11** to **22**, Short Answer type **II** questions of **three** marks each.*

*(v) Section **D** contains question number **23**, Value Based Question of **four** marks.*

*(vi) Section **E** contains question number **24** to **26**, Long Answer type questions of **five** marks each.*

*(vii) There is no overall choice in the question paper, however, an internal choice is provided in **one** question of **two** marks, **one** question of **three** marks and all **three** questions of **five** marks. An examinee is to attempt any **one** of the questions out of the **two** given in the question paper with the same question number.*

QUESTION PAPER CODE 57/1/1
SECTION A

1. A geneticist interested in studying variations and patterns of inheritance in living beings prefers to choose organisms for experiments with shorter life cycle. Provide a reason. 1

2. Name the transcriptionally active region of chromatin in a nucleus. 1

3. State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialization period in England. 1

4. Indiscrimate diagnostic practices using X-rays etc., should be avoided. Give one reason. 1

5. What is Biopiracy ?

SECTION - B

6. After a brief medical examination a healthy couple came to know that both of them are unable to produce functional gametes and should look for an 'ART' (Assisted Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child. 2

7. Differentiate between male and female heterogamety. 2

8. How has mutation breeding helped in improving the production of mung bean crop? 2

9. Mention a product of human welfare obtained with the help of each one of the following microbes :

   (a) LAB

   (b) *Saccharomyces cerevisiae*

   (c) *Propionibacterium sharmanii*

   (d) *Aspergillus niger* 2

10. Many fresh water animals can not survive in marine environment. Explain. 2

OR

How are productivity, gross productivity, net primary productivity and secondary productivity interrelated?

SECTION - C

11. Double fertilization is reported in plants of both, castor and groundnut. However, the mature seeds of groundnut are non-albuminous and castor are albuminous. Explain the post fertilization events that are responsible for it. 3

12. Describe the process of Parturition in humans. 3

13. A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible. 3

14. (a) A DNA segment has a total of 1000 nucleotides, out of which 240 of them are adenine containing nucleotides. How many pyrimidine bases this DNA segment possesses? 1

    (b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer. 2

15. Explain adaptive radiation with the help of a suitable example. 3

16. A team of students are preparing to participate in the inter school sports meet. During a practice session you find some vials with labels of certain cannabionoids.

    (a) Will you report to the authorities? Why? 1

    (b) Name a plant from which such chemicals are obtained. 1

    (c) Write the effect of these chemicals on human body. 1

17. Enlist the steps involved in inbreeding of cattle. Suggest two disadvantages of this practice. 3

18. Choose any three microbes, from the following which are suited for organic farming

which is in great demand these days for various reasons. Mention one application of each one chosen. 3

Mycorrhiza; Monascus; Anabaena; Rhizobium; Methanobacterium; Trichoderma.

19. Recombinant DNA-technology is of great importance in the field of medicine. With the help of a flow chart, show how this technology has been used in preparing genetically engineered human insulins. 3

20. Draw a labelled sketch of sparged-stirred-tank bioreactor. Write its application. 3

21. Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modem scientific method and write the procedure that would help in the identification of kinship.

22. Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantages that can protect such threatened species from getting extinct ? 3

OR

"Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body." Explain.

SECTION - D

23. Since October 02,2014 "Swachh Bharat Abhiyan" has been launched in our country. 4

(a) Write your views on this initiative giving justification.

(b) As a biologist name two problems that you may face while implementing the programme in your locality.

(c) Suggest two remedial methods to overcome these problems.

SECTION - E

24. A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds. Answer the following questions giving reasons : 5

(a) What is the minimum number of pollen grains that must have been involved in the pollination of its pistil ?

(b) What would have been the minimum number of ovules present in the ovary ?

(c) How many megaspore mother cells were involved?

(d) What is the minimum number of microspore mother cells involved in the above case?

(e) How many male gametes were involved in this case?

OR

During the reproductive cycle of a human female, when, where and how does a placenta develop ? What is the function of placenta during pregnancy and embryo development ?

25. Explain the genetic basis of blood grouping in human population. 5

OR

How did Hershey and Chase established that DNA is transferred from virus to bacteria?

26. "Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies." Explain.

OR

Describe the advantages for keeping the ecosystems healthy.

QUESTION PAPER CODE 57/1

SECTION A

1. How many chromosomes do drones of honeybee possess? Name the type of cell division involved in the production of sperms by them. 1

2. What is a cistron ? 1

3. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?

4. Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment? 1

5. List two advantages of the use of unleaded petrol in automobiles as fuel. 1

SECTION - B

6. Why do moss plants produce very large number of male gametes ? Provide one reason. What are these gametes called ? 2

7. (a) Select the homologous structures from the combinations given below:

   (i) Forelimbs of whales and bats

   (ii) Tuber of potato and sweet potato

   (iii) Eyes of octopus and mammals

   (iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita*

   (b) State the kind of evolution they represent. 2

8. (a) Why are the plants raised through micropropagation termed as somaclones ?

   (b) Mention two advantages of this technique. 2

9. Explain the different steps involved during primary treatment phase of sewage. 2

10. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.

OR

List any four techniques where the principle of ex-situ conservation of biodiversity has been employed. 2

SECTION - C

11. State what is apomixis. Comment on its significance. How can it be commercially used ? 3

12. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio. Work out a cross to show how it is possible. 3

13. Explain the significance of satellite DNA in DNA fingerprinting technique. 3

14. What does the following equation represent? Explain. 3

$$p^2 + 2\,pq + q^2 = 1$$

15. A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

(a) Write what did the doctor inject into the patient's body.

(b) How do you think this injection would protect the patient against the disease?

(c) Name the disease against which this injection was given and the kind of immunity it provides. 3

16. Enumerate any six essentials of good, effective Dairy Farm Management Practices. 3

17. State the medicinal value and the bioactive molecules produced by *Streptococcus*, *Monascus* and *Trichoderma*. 3

OR

What are methanogens? How do they help to generate biogas ? 3

18. Rearrange the following in the correct sequence to accomplish an important bio-technological reaction: 3

(a) *In vitro* synthesis of copies of DNA of interest

(b) Chemically synthesized oligonucleotides

(c) Enzyme DNA-polymerase

(d) Complementary region of DNA

(e) Genomic DNA template

(D Nucleotides provided

(g) Primers

(h) Thermostable DNA-polymerase (from *Thermus aquaticus*)

(i) Denaturation of ds-DNA

19. Describe any three potential applications of genetically modified plants. 3

20. How did an American Company, Eli Lilly use the knowledge of r-DNA technology to produce human insulin? 3

21. How do snails, seeds, bears, zooplanktons, fungi and bacteria adapt to conditions unfavourable for their survival ? 3

22. With the help of a flow chart, show the phenomenon of biomagnification of DDT in an aquatic food chain. 3

SECTION - D

23.* Your school has been selected by the Department of Education to organize and host an interschool seminar on "Reproductive Health - Problems and Practices". However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is "too embarrassing."

Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.

SECTION - E

24. (a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out.

(b) Write the importance of such experiments. 5

OR

Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female. 5

25. (a) Why are thalassemia and haemophilia categorized as Mendelian disorders? Write the symptoms of these diseases. Explain their pattern of inheritance in humans.

(b) Write the genotypes of the normal parents producing a haemophilic son. 5

OR

How do m-RNA, t-RNA and ribosomes help in the process of translation ? 5

26. (a) List the different attributes that a population has and not an individual organism.

(b) What is population density?" Explain any three different ways the population density can be measured, with the help of an example each. 5

OR

"It is often said that the pyramid of energy is always upright. On the other hand, the pyramid of biomass can be both upright and inverted." Explain with the help of examples and sketches. 5

Marking Scheme — Biology (Theory)

General Instructions :

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 (x) at incorrect value portion and mark it zero (in words only).
8. Add up ticks or the halfticks 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 57/1/1

SECTION – A

Q. Nos. 1 - 8 are of one marks each

1. A geneticist interested in studying variations and patterns of inheritance in living beings prefers to choose organisms for experiments with shorter life cycle. Provide a reason.

Ans. Many generations can be obtained (in a short time)

/ / variations can be exhibited / selected faster [1 Mark]

2. Name the transcriptionally active region of chromatin in a nucleus. 1

Ans. Euchromatin / Exon [1 Mark]

3. State a reason for the increased population of dark coloured moths coinciding with the loss of lichens (on tree barks) during industrialization period in England.

Ans. Natural selection / survival of fittest / escaped predators due to camouflage [1 Mark]

4. Indiscrimate diagnostic practices using X-rays etc., should be avoided. Give one reason.

Ans. (Act as) Carcinogen / (harmful) mutation / chromosomal aberration / damage to DNA / normal cells converted to neoplastic [1 Mark]

5. What is Biopiracy ?

Ans. Illegal / non-authorized / non-compensated use of bioresources by organisations (MNC) [1 Mark]

SECTION - B

Q. Nos. 6 -10 are of two marks each

6. After a brief medical examination a healthy couple came to know that both of them are unable to produce functional gametes and should look for an 'ART' (Assisted Reproductive Technique). Name the 'ART' and the procedure involved that you can suggest to them to help them bear a child.

Ans. Test tube baby programme = ½

Collection of ova and sperm from donor = ½

(Corresponding procedure correctly explained) = ½ + ½

Explanation:

IVF - Fertilisation outside the body in almost similar conditions as that in the body

ICSI - Sperm is directly injected into the ovum

ET - Embryo is transferred into reproductive tract / uterus

ZIFT - Zygote or early embryos (upto eight blastomeres) transferred into fallopian tube

IUT - Early embryos (with more than eight blastomeres) transferred into uterus [2 Marks]

7. Differentiate between male and female heterogamety. **2**

Ans.

	Male heterogamety	Female heterogamety
(i)	Male produces two types of gametes (while female produces only one type of gamete)	Female produces two types of gametes (while male produces only one type of gamete) = 1
(ii)	XY / XO type / / two types of heterogamety	ZW type / / lone type of heterogamety = 1

[2 Marks]

8. How has mutation breeding helped in improving the production of mung bean crop?

Ans. Produce disease resistant varieties, against yellow mosaic virus / powdery mildew = 1 + 1 [2 Marks]

9. Mention a product of human welfare obtained with the help of each one of the following microbes :

(a) LAB

(b) <u>Saccharomyces cerevisiae</u>

(c) <u>Propionibacterium sharmanii</u>

(d) <u>Aspergillus niger</u>

Ans. a) Milk to curd = ½

b) Bread / ethanol / alcoholic drinks / whiskey / brandy / beer / rum = ½

c) Swiss cheese = ½

d) Citric acid = ½ [½ x 4 =2 Marks]

10. Many fresh water animals can not survive in marine environment. Explain.

Ans. High salt concentration outside / hypertonic surroundings = 1

Loss of water from body / exosmosis from animal body / animal suffers osmotic problems = 1 [2 Marks]

OR

How are productivity, gross productivity, net primary productivity and secondary productivity interrelated?

Ans. Productivity is rate of biomass production = ½

GPP - R = NPP = 1

NPP - is biomass available to consumers for secondary productivity = ½

½ + 1+½ = 2 Marks]

SECTION - C

Q. Nos. 11 - 22 are of three marks each

11. Double fertilization is reported in plants of both, castor and groundnut. However, the mature seeds of groundnut are non-albuminous and castor are albuminous. Explain the post fertilization events that are responsible for it.

Ans. Development of endosperm (preceding the embryo) takes place in both, developing embryo derives nutrition from endosperm = ½ + ½

Endosperm is retained / persists / not fully consumed in castor, endosperm is consumed in groundnut = 1 + 1 [3 Marks]

12. Describe the process of Parturition in humans.

Ans. - Signals originate from the fully developed foetus and placenta,

- Induce mild uterine contractions (foetal ejection reflex) ,
- Triggers release of oxytocin (from maternal pituitary) ,
- Oxytocin acts on uterine muscles and cause stronger uterine contractions,
- Stimulatory reflex between the uterine contraction and oxytocin secretion continues resulting in stronger and stronger contraction
- Expel the baby from the uterus = ½ × 6 [3 Marks]

13. A teacher wants his/her students to find the genotype of pea plants bearing purple coloured flowers in their school garden. Name and explain the cross that will make it possible.

Ans. Test cross = 1

Purple flower to be crossed with white (homozygous recessive) flower = 1

If all flowers of F_1 are purple then genotype is homozygous dominant / PP = ½

If 50% are purple and 50% are white then genotype is heterozygous dominant / Pp = ½

/ / (same thing can be shown with the help of crosses) (3 Marks]

14. (a) A DNA segment has a total of 1000 nucleotides, out of which 240 of them are adenine containing nucleotides. How many pyrimidine bases this DNA segment possesses?

(b) Draw a diagrammatic sketch of a portion of DNA segment to support your answer.

Ans. (a) Pyrimidine = 500, = ½

(i) Calculation

A = T, A = 240 hence T = 240

A + T = 240 + 240 = 480

so G+C = 1000 - 480 = 520

G = C, so C = $\frac{520}{2} = 260$

(ii) Purine A and G always pair with T and C respectively

(iii) $\frac{A}{G} = \frac{T}{C} = 1$ (Chargaff rule)

= ½

so pyrimidines = C + T

= 260 + 240 = 500

(b)

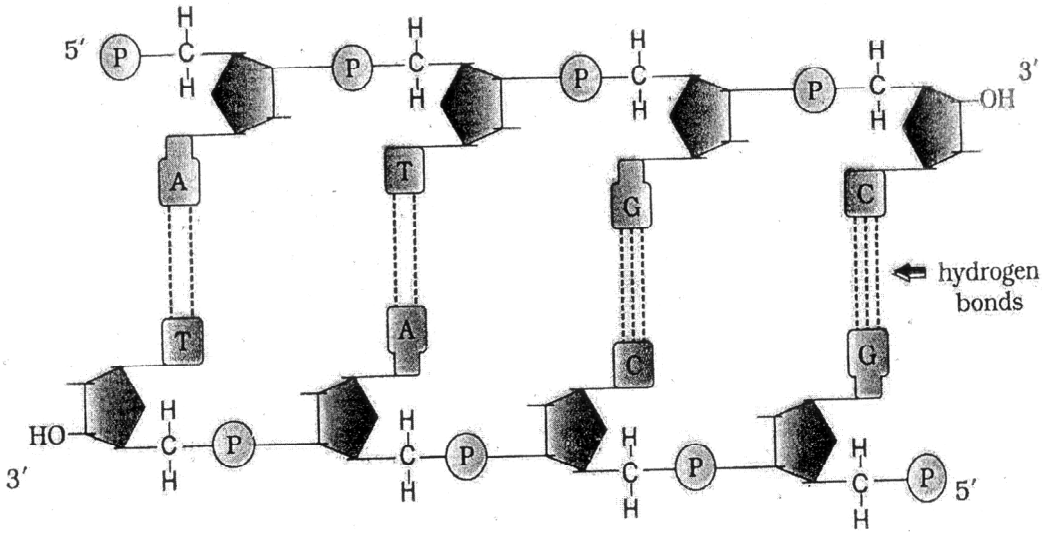


Diagram showing polarity = ½

A-T = ½

G-C= ½

H-bond = ½ [1 + 2 = 3 Marks]

15. Explain adaptive radiation with the help of a suitable example.

Ans. Evolution of different species in a given geographical area starting from a point and literally radiating to other geographical areas habitat is called adaptive radiation

= 1

A number of marsupials each different from other / Tasmanian wolf / Tiger Cat / Banded anteater / Marsupial rat / Kangaroo / Wombat / Bandicoot / Koala / Marsupial mole / Sugar glider (any two or more) , evolved from an ancestral stock, but all within Australian continent = 1 + ½ + ½ = 2

/ / Darwin's finches, from original seed eating features many other forms with altered beaks arose, enabling them to become insectivorous / vegetarian finches on the same (Galapagos) islands = 1+½+½ = 2

[1+2 = 3 Marks]

16. A team of students are preparing to participate in the interschool sports meet. During a practice session you find some vials with labels of certain cannabionoids.

(a) Will you report to the authorities? Why?

(b) Name a plant from which such chemicals are obtained.

(c) Write the effect of these chemicals on human body.

Ans. (a) Yes = ½

May be abused by sports person = ½

(b) Cannabis (sativa) / any other relevant plant = 1

(c) Effects cardiovascular system of the body = 1

[1+1+1 = 3 Marks]

17. Enlist the steps involved in inbreeding of cattle. Suggest two disadvantages of this practice.

Ans. Inbreeding involves mating of closely related individuals within the same breed for 4-6 generations = ½

Superior males and superior females are identified and mated in pairs, the progeny are evaluated, superior males and females among them are selected for further mating = ½ × 3

Disadvantages: Inbreeding depression, reduction in fertility, reduction in productivity (any two) = ½ × 2

[3 Marks]

18. Choose any three microbes, from the following which are suited for organic farming which is in great demand these days for various reasons. Mention one application of each one chosen.

Mycorrhiza; Monascus; Anabaena; Rhizobium; Methanobacterium; Trichoderma.

Ans. Mycorrhiza: (Fungal symbiont of the association) Abosrb phosphorus from soil

Anabaena: Fix atmospheric nitrogen / Adds organic matter to the soil

Rhizobium: Fix atmospheric nitrogen (in leguminous plants)

Methanobacterium : They digest cellulosic material and the product / spent slurry can be used as fertiliser .

Trichoderma : Biocontrol agent for several plant pathogens

(Any 3 microbes = ½ × 3 = 1½)

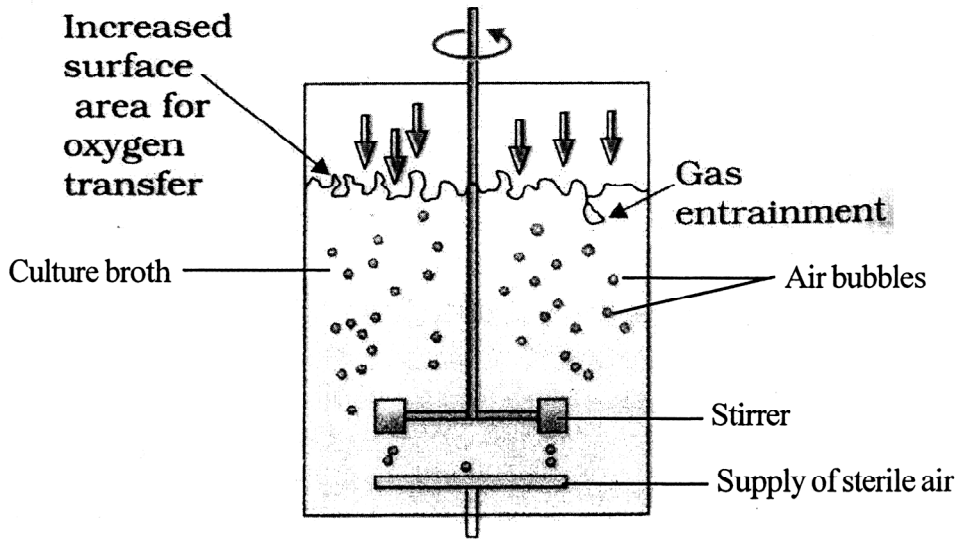
(Any 3 corresponding roles = ½ × 3 = 1½) [3 Marks]

19. Recombinant DNA-technology is of great importance in the field of medicine. With the help of a flow chart, show how this technology has been used in preparing genetically engineered human insulins.

Ans. Insulin consists of two (short) polypeptide chains (A and B), linked by disulphide bonds, two DNA sequences corresponding to chain A and B prepared (by Eli Lily company) , introduced them into plasmids of E. coli, chain A and B produced separately, extracted and combined by creating disulphide bonds = ½ x 6 [3 Marks]

20. Draw a labelled sketch of sparged-stirred-tank bioreactor. Write its application.

Ans.



Correct diagram = 1

Any two correct labellings = ½ + ½

Application = Produces larger biomass leading to higher yields of desired protein / recombinant protein / processing large volume of culture / conversion of raw materials into specific product biologically = 1 [3 Marks]

21. Following the collision of two trains a large number of passengers are killed. A majority of them are beyond recognition. Authorities want to hand over the dead to their relatives. Name a modem scientific method and write the procedure that would help in the identification of kinship.

Ans. DNA fingerprinting (analysis) = ½

- Isolation and digestion of DNA by restriction endonuclease
- Separation of DNA fragments by electrophoresis and transferring them to synthetic membranes / nitrocellulose / nylon
- Hybridisation using labelled VNTR probe
- Detection of hybridised DNA fragments by autoradiography
- Matching banding pattern of DNA / DNA fingerprints / autoradiograms of the passengers killed and that of relatives = ½ × 5 [3 Marks]

22. Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantages that can protect such threatened species from getting extinct ?

Ans. Ex-situ conservation = 1

Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care = 1

Botanical garden / tissue culture / micro propagation / seed bank = ½

Zoological park / wild life safari park / cryopreservation = ½ [3 Marks]

OR

"Determination of Biological Oxygen Demand (BOD) can help in suggesting the quality of a water body." Explain.

Ans. High BOD of a water body indicates more number of micro-organisms in water, resulting in bad quality of water / death of aquatic creatures, more polluting potential = 1 × 3

//Lower BOD of water body indicates less number of micro-organisms in water, good quality of water / aquatic life flourishes, less polluting potential = 1 × 3 [3 Marks]

SECTION - D

Q. Nos. 23 is of four marks

23. Since October 02,2014 "Swachh Bharat Abhiyan" has been launched in our country.

(a) Write your views on this initiative giving justification.

(b) As a biologist name two problems that you may face while implementing the programme in your locality.

(c) Suggest two remedial methods to overcome these problems.

Ans. (a) Value point conveying importance of clean environment / surrounding = 1

(b) Social attitude / co-ordination / financial issues / disposal of collected garbage / separation of biodegradable and non-degradable waste / lack of awareness / any other relevant problem (Any two) = 1 + 1

(c) Campaigning / creating awareness / organising competitions / giving incentives / provision of imposing penalty / complaining to appropriate authority / publicity through mass media / using masks or gloves for separation and disposal of various categoriers of garbage or any other relevant point (Any two) = ½ + ½

[1 + 2 + 1 = 4 Marks]

SECTION - E

24. A flower of tomato plant following the process of sexual reproduction produces 240 viable seeds. Answer the following questions giving reasons :

(a) What is the minimum number of pollen grains that must have been involved in the pollination of its pistil ?

(b) What would have been the minimum number of ovules present in the ovary ?

(c) How many megaspore mother cells were involved?

(d) What is the minimum number of microspore mother cells involved in the above case?

(e) How many male gametes were involved in this case?

Ans. (a) 240, one pollen grain participates in fertilisation of one ovule = ½ + ½

(b) 240 , one ovule after fertilisation forms one seed = ½ + ½

(c) 240 , each MMC forms four megaspores out of which only one remain functional = ½ + ½

(d) 60 , each microspore mother cell meiotically divides to form four pollen grains (240/4 = 60) = ½ + ½

(e) 480, each pollen grain carries two male gametes (which participate in double fertilisation) (240 × 2 = 480) = ½ + ½

[1 × 5 = 5 Marks]

OR

During the reproductive cycle of a human female, when, where and how does a placenta develop ? What is the function of placenta during pregnancy and embryo development ?

Ans. After implantation, uterus, chorionic villi and uterine tissue become interdigitated (physically fused) =1+1+1

Placenta facilitates supply of oxygen / nutrients to the embryo = ½

Removal of carbon dioxide / waste material / excretory material produced by the embryo = ½ × 2

Production of hCG / hPL / estrogens / progestogens (Any two) = ½ × 2

[3+2 = 5 Marks]

25. Explain the genetic basis of blood grouping in human population.

Ans. (i) Blood group in human population determined by gene 'I' , which has three allele I^A and I^B and i (multiple allelism) = ½ + ½

(ii) I^A I^B are dominant allele (codominance) each forming different type of sugar polymer on the surface of RBC , while allele 'i' is recessive and does not produce any sugar = ½ + ½

I^A I^A , I^A i – A group = ½

I^B I^B , I^B i – B group = ½

$I^A I^B$ – AB group = ½

ii – O group = ½

(iii) Since humans are diploid / each person possesses any two of three 'I' gene alleles, resulting into six different genotypic combination and four phenotypic expression = ½ + ½

[5 Marks]

OR

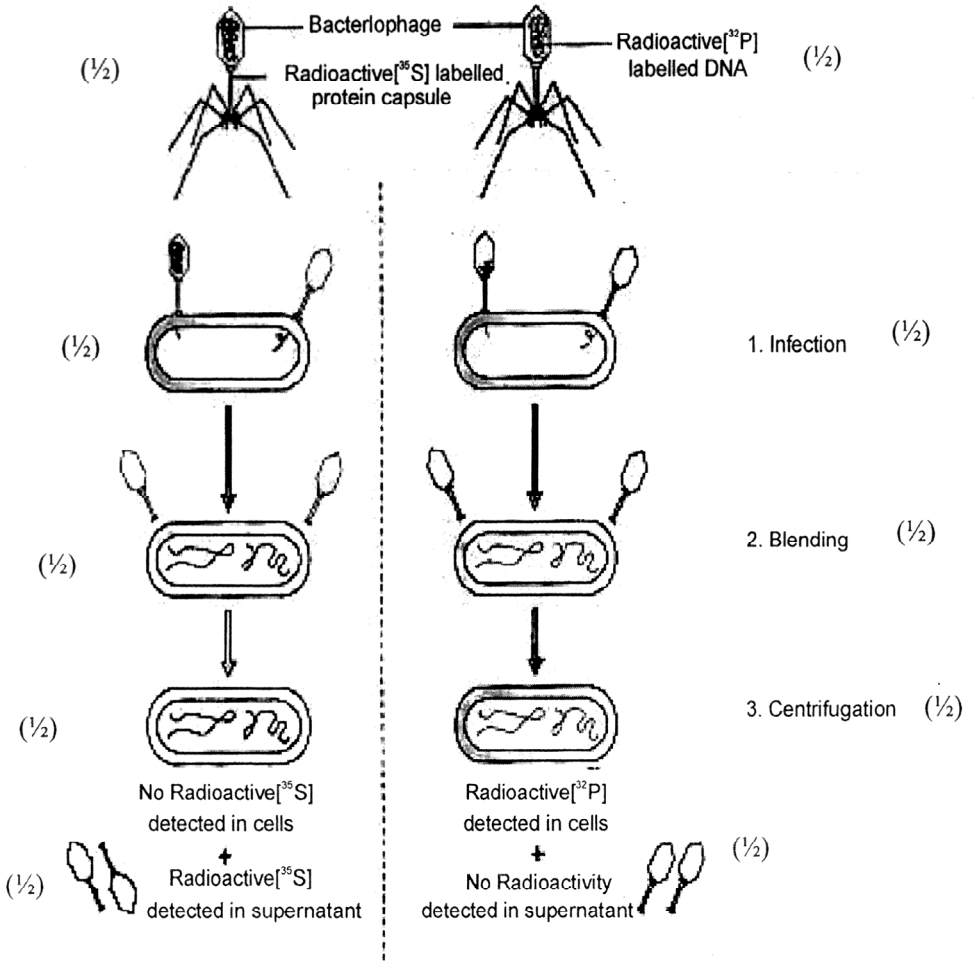
How did Hershey and Chase established that DNA is transferred from virus to bacteria?

Ans.
- Some bacteriophage were grown in a medium that contained ^{32}P / radioactive phosphorus, while some were grown in a medium that contained ^{32}S / radioactive sulphur = ½ × 2
- the labelled bacteriophage from both media were allowed to infect E. coli = 1
- In both the cases viral coats were removed from the bacteria by agitating them in a blender = 1
- The virus particles were separated from the bacteria by spinning them in a centrifuge = 1
- No radioactivity was detected in cells (E. coli) but detected in supernatant in case where bacteriophage were labelled with radioactive sulphur = ½
- Radioactivity detected in cells (E. coli) while no radioactivity detected in supernatant in another case where bacteriophage were labelled with radioactive phosphorus = ½

  (Phosphorus being a constituent of DNA indicates that DNA is the genetic material that is passed from virus to bacteria)

[5 Marks]

// **The following diagrammatic representation can be considered in lieu of the above explanation.**



[½ × 10 = 5 Marks]

26. "Analysis of age-pyramids for human population can provide important inputs for long-term planning strategies." Explain.

Ans. Age pyramids show age distribution of males and females in a combined diagram = 1

The shape of the pyramid reflects the growth status of the population whether it is growing or stable or declining = 1

Pyramids also indicate the ratio of pre-reproductive, reproductive and post reproductive individuals in a population = 1

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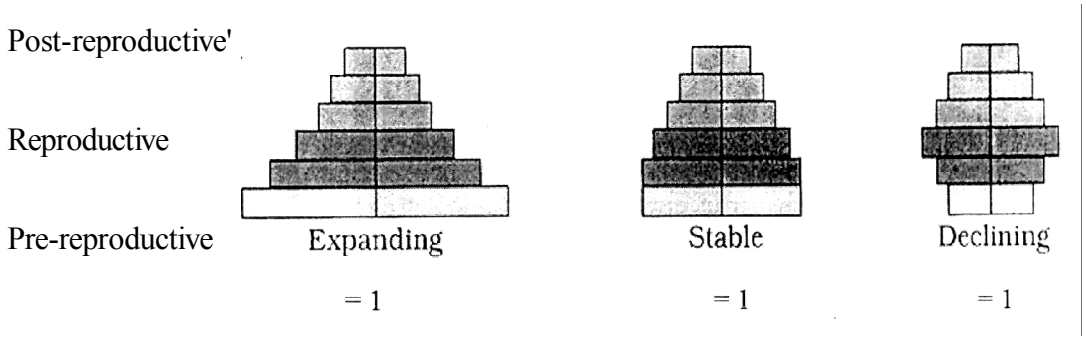


Planing of health / education / transport / infra-structure / finance / food / employment can depend on the age-pyramid analysis of a population / any other relevant point. (Any two with proper explanation) = 1 + 1

[5 Marks]

OR

Describe the advantages for keeping the ecosystems healthy.

Ans. (i) Purify air / purify water

(ii) Mitigates drought/ mitigates flood

(iii) Cycle nutrients

(iv) Generate fertile soil

(v) Provide wildlife habitat

(vi) Maintain biodiversity

(vii) Pollinate crop

(viii) Provide storage site for carbon

(ix) Provide aesthetic value / provide cultural value / provide spiritual value

(x) Provide stable food chain

(xi) Provide economically useful forest produces

(xii) Provide sustainable biological legacy to future generations

(Description of any five advantages) = 1 x 5

[5 Marks]

Question Paper Code 57/1

SECTION – A

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

1. How many chromosomes do drones of honeybee possess? Name the type of cell division involved in the production of sperms by them.

Ans. 16, Mitosis = ½ + ½ [1 Mark]

2. What is a cistron ?

Ans. A segment of DNA , Coding for a polypeptide = ½ + ½ [1 Mark]

3. Retroviruses have no DNA. However, the DNA of the infected host cell does possess viral DNA. How is it possible?

Ans. Reverse transcription of viral RNA into viral DNA, then integrates/ incorporates With the host DNA = ½ + ½ [1 Mark]

4. Why do children cured by enzyme-replacement therapy for adenosine deaminase deficiency need periodic treatment?

Ans. As this therapy does not cure the disease completely = 1 [1 Mark]

5. List two advantages of the use of unleaded petrol in automobiles as fuel.

Ans. (i) Allows the catalytic convertor to remain active = ½

(ii) Reduces air pollution = ½ [1 Mark]

SECTION - B

6. Why do moss plants produce very large number of male gametes ? Provide one reason. What are these gametes called ?

Ans. To compensate the loss of male gametes during their transport(to the non-motile female gamete) through water/ to increase chances of fertilisation, antherozoids = 1 + 1 [2 Marks]

7. (a) Select the homologous structures from the combinations given below:

(i) Forelimbs of whales and bats

(ii) Tuber of potato and sweet potato

(iii) Eyes of octopus and mammals

(iv) Thorns of *Bougainvillea* and tendrils of *Cucurbita*

(b) State the kind of evolution they represent.

Ans. (a) (i) Forelimbs of whales and bats = ½

(iv) Thoms of Bougainvillea and tendrils of Cucurbita = ½

(b) Divergent Evolution = 1 [2 Marks]

8. (a) Why are the plants raised through micropropagation termed as somaclones ?

(b) Mention two advantages of this technique.

Ans. (a) Genetically identical = 1

(b) Large number of plants in short duration, Virus free plants = ½ + ½ [2 Marks]

9. Explain the different steps involved during primary treatment phase of sewage.

Ans. Physical removal of particles (large and small),by filtration and sedimentation, forming primary sludge/sedimented solids, forming effiuent (supernatant) for secondary treatment = ½ x4 [2 Marks]

10. What is mutualism? Mention any two examples where the organisms involved are commercially exploited in agriculture.

Ans. Interaction between two species in which both are benefitted = 1

i. *Rhizobium* in the roots (nodules) of legumes = ½

ii. *Mycorrhiza / Glomus* with the roots of higher plants = ½ [2 Marks]

OR

List any four techniques where the principle of ex-situ conservation of biodiversity has been employed.

Ans. Cryopreservation, in vitro fertilisation, micro propagation / tissue culture, sperm bank / seed bank / gene bank = ½ x 4 [2 Marks]

SECTION - C

Q Nos. 11-22 are of three marks each

11. State what is apomixis. Comment on its significance. How can it be commercially used ?

Ans. Form of asexual reproduction producing seeds without fertilization / type of asexual reproduction that mimics sexual reproduction to form seeds without fertilisation = 1

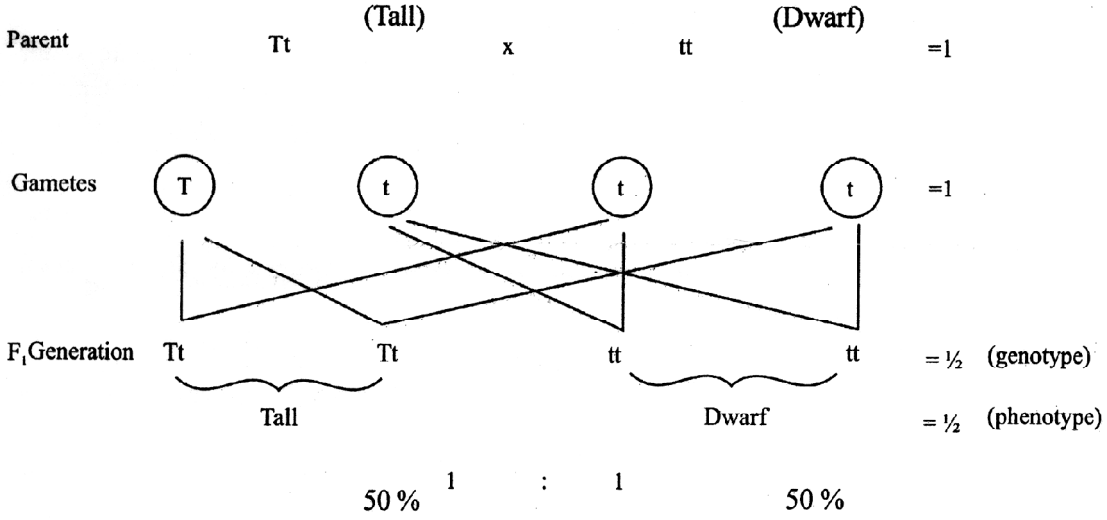
Parental characters are maintained in the progeny/offspring (as there is no meiosis/ segregation of characters) = 1

If desired hybrid seeds are made apomictics the farmers can keep on using the hybrid seeds to raise new crops year after year = 1

[3 Marks]

12. During a monohybrid cross involving a tall pea plant with a dwarf pea plant, the offspring populations were tall and dwarf in equal ratio. Work out a cross to show how it is possible.

Ans.



Note: (Similar cross shown in a Punnett square to be accepted) [3 Marks]

13. Explain the significance of satellite DNA in DNA fingerprinting technique.

Ans. (i) They do not code for any proteins,

(ii) They form large part of the human genome,

(iii) They show high degree of polymorphism / Specific to each individual = 1 × 3 [3 Marks]

14. What does the following equation represent? Explain.

$$p^2 + 2pq + q^2 = 1$$

Ans. Hardy Weinberg's Principle / allele frequencies in a population are stable and is constant from generation to generation, / represents stable allelic frequency in a population indicating no evolution occuring, p^2 frequency of homozygous dominant / AA, 2 pq frequency of heterozygous/ Aa.q^2 frequency of homozygous recessive / aa = ½×6

Note: (if AA, Aa, aa have been indicated using any other alphabet correctly can be accepted) [3 Marks]

15. A heavily bleeding and bruised road accident victim was brought to a nursing home. The doctor immediately gave him an injection to protect him against a deadly disease.

(a) Write what did the doctor inject into the patient's body.

(b) How do you think this injection would protect the patient against the disease?

(c) Name the disease against which this injection was given and the kind of immunity it provides.

Ans. (a) Tetanus antitoxins/Tetanus toxoid =1

(b) The preformed antibody injected, act on the pathogen immediately to provide protection = ½ x 2

(c) Tetanus, passive immunity = ½ x 2 [3 Marks]

16. Enumerate any six essentials of good, effective Dairy Farm Management Practices.

Ans. Selection of high yielding and diseases resistant breeds, housed well, adequate water supply, maintained disease free, feeding in a scientific manner, regular visits by veteranary doctors, regular inspection and record keeping, cleanliness and hygiene while milking and transport (any six) = ½ ×6 [3 Marks]

17. State the medicinal value and the bioactive molecules produced by *Streptococcus, Monascus and Trichoderma*.

Ans. *Streptococcus;* Streptokinase, clot buster / remove clot from the blood vessels = ½ + ½

Monascus; Statin, blood cholesterol lowering agent / it inhibits the enzymes responsible for synthesis of cholesterol = ½ + ½

Trichoderma; cyclosporin A, immunosuppressive agents used in organ transplantation = ½ + ½

[3 Marks]

OR

What are methanogens? How do they help to generate biogas ?

Ans. Anaerobic, methane producing bacteria = ½ x 2

methanogens generate biogas, when act on cellulose rich biowaste (anerobically) = 1 + 1

[3 Marks]

18. Rearrange the following in the correct sequence to accomplish an important biotechnological reaction:

(a) *In vitro* synthesis of copies of DNA of interest

(b) Chemically synthesized oligonucleotides

(c) Enzyme DNA-polymerase

(d) Complementary region of DNA

(e) Genomic DNA template

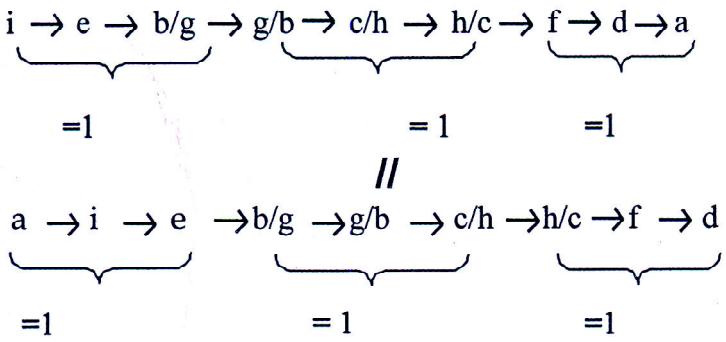
(D Nucleotides provided

(g) Primers

(h) Thermostable DNA-polymerase (from Thermus aquaticus)

(i) Denaturation of ds-DNA

Ans. Correct sequence is



Note: (Stop Marking where the sequence goes wrong) [3 Marks]

19. Describe any three potential applications of genetically modified plants.

Ans. More tolerant to abiotic stress, less dependence on chemical pesticides, reduces post harvest losses, increase efficiency of mineral usage by plants. enhance nutritional value of food. eg. Vitamin A enriched rice (any three) = 1 + 1 + 1

[3 Marks]

20. How did an American Company, Eli Lilly use the knowledge of r-DNA technology to produce human insulin?

Ans. Two chains of DNA sequence corresponding to A& B chains of human insulin prepared, introduced them into plasmids of E.coli to produce separate A& B chains, A& B chains extracted combined by creating disulphide bonds = 1 × 3

[3 Marks]

21. How do snails, seeds, bears, zooplanktons, fungi and bacteria adapt to conditions unfavourable for their survival ?

Ans. Snail-aestivation = ½

Seeds-dormancy/suspended metabolic activities = ½

Bear-Hibernation = ½

Zooplankton- diapause/suspended development = ½

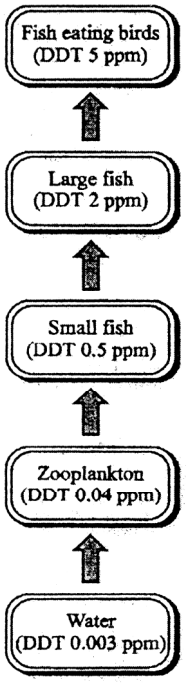
Fungi-Spore/Zygospore = ½

Bacteria-Cyst/spore = ½

[3 Marks]

22. With the help of a flow chart, show the phenomenon of biomagnification of DDT in an aquatic food chain.

Ans.



5 stages- ½ Mark each (½ × 5) the flow chart should show arrows in correct direction with increasing levels of DDT = (½)

[3 Marks]

SECTION - D

Q No. 23 is of four mark

23. Your school has been selected by the Department of Education to organize and host an interschool seminar on "Reproductive Health - Problems and Practices". However, many parents are reluctant to permit their wards to attend it. Their argument is that the topic is "too embarrassing."

Put forth four arguments with appropriate reasons and explanation to justify the topic to be very essential and timely.

Ans. 1. The issue of puberty and adolescence need to be addressed effectively with the respective age group because many changes take place in the body during adolescence of which they are supposed to be aware of = 1

2. To bring in awareness about their reproductive health and its effect on their physical, emotional and social being = 1

3. To address the increase in sex abuse and sex crimes in our country = 1

4. Myths and misconceptions related to reproductive issues = 1

Note: (any other related or relevant argument with reasons may be accepted)

[4 Marks]

SECTION - E

Q Nos. 24-26 are of five marks each

24. (a) Plan an experiment and prepare a flow chart of the steps that you would follow to ensure that the seeds are formed only from the desired sets of pollen grains. Name the type of experiment that you carried out.

(b) Write the importance of such experiments.

Ans. (a) Selection of flowers from desired plants $\rightarrow$ emasculation $\rightarrow$ bagging $\rightarrow$ dusting of the pollens on the stigma of the flowers that were bagged $\rightarrow$ flower rebagged $\rightarrow$ fruit formed = ½ x 6

Artificial Hybridisation = 1

(b) Production of superior/ improved varieties of plants = 1

[5 Marks]

OR

Describe the roles of pituitary and ovarian hormones during the menstrual cycle in a human female.

Ans. Pituitary hormones:

(When levels of FSH is high) FSH, induces follicular growth, secretion of estrogen by follicles, (when LH surge is there in the mid of the cycle) lutinising hormones/LH, along with FSH leads to ovulation, and then formation of corpus luteum = ½ × 6

Ovarian hormone:

Estrogen, repair/proliferation of endometrium,

Progesterone, maintains endometrium for implantation = ½ × 4

(Low level of progesterone leads to menstrual flow)

[5 Marks]

25. (a) Why are thalassemia and haemophilia categorized as Mendelian disorders? Write the symptoms of these diseases. Explain their pattern of inheritance in humans.

(b) Write the genotypes of the normal parents producing a haemophilic son.

Ans. (a) Both are caused due to alteration/mutation, in a single gene and follow Mendelian pattern of inheritance = ½ x 2

symptoms

Thalassemia -anaemia (caused due to defective/abnormal Hb),

Haemophilia -non stop bleeding even in minor injury = ½ × 2

pattern of inheritance-

Thalassemia autosomal recessive inheritance pattern, inherited from heterozygous/ parent carrier = ½ × 2

haemophilia- X linked recessive inheritance, inherited from a haemophilic father/ carrier mother (females are rarely haemophilic) = ½ × 2

(b) X^hX-Mother = ½

XY- Father = ½

[5 Marks]

OR

How do m-RNA, t-RNA and ribosomes help in the process of translation ?

Ans. mRNA provides a template, with codons for specific amino acids to be linked to form a polypeptide / protein = ½ + ½

tRNA brings amino acid to the ribosomes, reads the genetic code with the help of its anti-codons, initiator tRNA is responsible for starting polypeptide formation in the ribosomes, tRNAs are specific for each amino acid = ½ × 4

Ribosomes-(Cellular factories for proteins synthesis) its smaller sub unit binds with mRNA to initiate protein synthesis at the start codon/ AUG, in its larger sub unit there are two sites present which brings two amino acids close to each other helping them to form peptide bond, ribosomes moves from codon to codon along mRNA, amino acids are added one by one to form polypeptide/protein = ½ × 4

[5 Marks]

26. (a) List the different attributes that a population has and not an individual organism.

(b) What is population density?" Explain any three different ways the population density can be measured, with the help of an example each.

Ans. (a) Attributes of population

Birth rate, Death Rate, sex ratio, age pyramids/age distribution (any two) = ½ × 2

(b) Population density -

Number of individuals per unit area at a given time/period = 1

1. Biomass / % Cover, e.g Hundred Parthenium plants and 1 huge banayan tree = ½ × 2

2. Relative Density, e.g Number of fish caught per trap from a lake = ½ × 2

3. Numbers, e.g Human population = ½ × 2

4. Indirect estimation, e.g. without actually counting/seeing them e.g. tiger census based on pugmarks and fecal pellets = ½ × 2

(Any three) [5 Marks]

OR

"It is often said that the pyramid of energy is always upright. On the other hand, the pyramid of biomass can be both upright and inverted." Explain with the help of examples and sketches.

Ans. TC (Tertiary consumer) 10J (10% available)

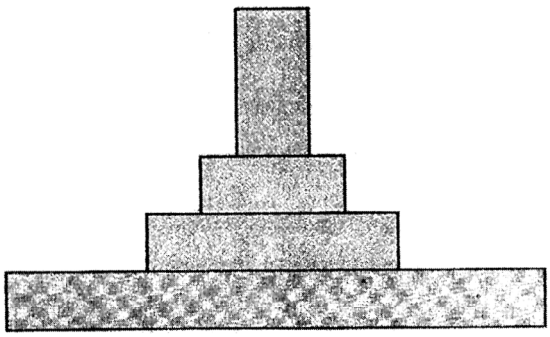
SC (Secondary consumer) 100J (10% available)

PC (primary consumer) 1000J (10% available)

1,000,000 J of Sunlight

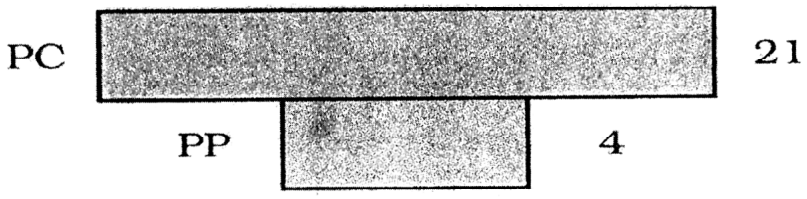
Upright Pyramid of Energy : e.g of any Grassland food chain depicting energy transfer at each trophic level = 1 + 1

Trophic level	**Dry Weight (kg m^{-2})**
TC	1.5
SC	11
PC	37
PP	809



Upright Pyramid of Biomass : e.g grassland food chain-grass → rabbit → fox → Tiger (Any other relevant example) = 1 for Diagram + ½ for example

Note: (If only two trophic levels are drawn with dry weight mentioned correctly can be accepted)



Inverted Pyramid of Biomass: e.g aquatic ecosystem where small standing crop of phytoplanktons supports large standing crop of zooplanktons = 1 for Diagram + ½ for example

[5 Marks]

BIOLOGY (Theory)
(FOR BLIND CANDIDATES ONLY)

Time allowed : 3 hours ***Maximum Marks : 70***

General Instructions:

*(i) There are a total of **26** questions and **five** sections in the question paper. **All** questions are compulsory.*

*(ii) Section **A** contains question number **1** to **5**, Very Short Answer type questions of **one** mark each.*

*(iii) Section **B** contains question number **6** to **10**, Short Answer type **I** questions of **two** marks each.*

*(iv) Section **C** contains question number **11** to **22**, Short Answer type **II** questions of **three** marks each.*

*(v) Section **D** contains question number **23**, Value Based Question of **four** marks.*

*(vi) Section **E** contains question number **24** to **26**, Long Answer type questions of **five** marks each.*

*(vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of **two** marks, one question of **three** marks and all three questions of **five** marks. An examinee is to attempt any one of the questions out of the two given in the question paper with the same question number.*

QUESTION PAPER CODE 57(B)

SECTION A

1. Why do internodal segments of sugarcane fail to propagate vegetatively even when in contact with damp soil? 1

2. Mention any two Mendelian recessive disorders in humans. 1

3. Why is DNA replication termed as semi-conservative? 1

4. Name the virus which causes one of the most common human ailments - the common cold. 1

5. Mention the role of 'Ori' in a cloning vector.

SECTION B

6. How does CuT act as a contraceptive? 2

OR

Mention the changes the zygote of fungi undergo before they develop into new individuals. Why do these changes take place? 2

7. Mention the pattern of inheritance of human skin colour: How does it deviate from that of Mendelian pattern of inheritance? 2

8. List any four characters that the plant breeders have tried to incorporate into crop plants so as to increase the crop yield. 2

9. Name the bioactive molecule that is used as immuno-suppressive agent and its source organism. 2

10. Name and explain the association that exists between cattle-egret and the cattle. 2

SECTION C

11. How is parthenogenesis different from parthenocarpy ? Mention one example of each. 3

12. State the function of placenta in humans. List the hormones secreted by it. 3

13. Explain the mechanism of sex-determination in honeybees. What is it called? 3

OR

Explain pleiotropy with the help of an example. 3

14. Name the different types of RNA along with their functions, that take part in the process of translation. 3

15. Study the following traits observed in a. human suffering from a genetic disorder :

Short statured, small round head, furrowed tongue and partially open mouth.

Identify this genetic disorder and mention its cause. Write two more characteristics of this disorder. 3

16. Trace the stages in the life cycle of *Plasmodium* that takes place in the mosquito. Write the scientific name of the protozoan which causes malignant malaria. 3

17. Explain the primary and secondary immune responses produced by our body. Name the type of antibody 3

(i) present in the colostrum of mother, and

(ii) that is produced in response to an allergen.

18. Write the three common approaches for the treatment of cancer. How are they administered on a patient? 3

19. How does a restriction endonuclease function ? Name a restriction endonuclease and write the specific sequence of bases that it recognizes. 3

20. How did Eli Lilly, using rDNA technique, make it possible to treat diabetic patients with human insulin ? Explain. 3

21. Biotechnology has played an important role in developing boll worm resistant cotton plants. Explain how such cotton plants are developed and made resistant to boll worm. 3

22. Name and explain the naturally occurring phenomenon responsible for heating of Earth's surface and its atmosphere. State how this phenomenon is responsible for global warming. 3

SECTION D

23. Indiscriminate human activities are one of the major reasons in causing imbalance in the environment. You, as a member of an eco-club of your school, are participating in "Save your environment" programme, organized by the cluster-schools in your neighbourhood. Why is there a dire need to organize such programmes ? List any three activities that you would suggest and plan to organize for this programme. Give reasons for each one of the activities. 4

SECTION E

24. (a) Self-pollination ensures seed formation yet cross pollination is preferred. Explain giving reasons.

(b) Explain any three outbreeding devices adopted by flowers In angiosperms. 5

OR

Explain the process of spermatogenesis in humans. 5

25. Explain the salient features of double-helix DNA strand. 5

OR

Work out a typical Mendelian dihybrid cross and explain how Mendel derived the Law of Independent Assortment from such a cross. 5

26. (a) Explain an ecological pyramid of numbers.

(b) Pyramids are mostly upright, but sometimes exceptions do occur. Why? Explain with the help of an example. 5

OR

You have read about Ahmed Khan, a plastic sack manufacturer and of his innovative idea of plastic waste management. Describe his effort and of the people who joined him and how they were benefitted. 5

Marking Scheme — Biology (Theory) (B)

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 (x) 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(B)

(FOR BLIND CANDIDATES ONLY)

SECTION – A

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

1. Why do internodal segments of sugarcane fail to propagate vegetatively even when in contact with damp soil?

Ans. Due to absence of meristem / buds in internodal region [1 Mark]

2. Mention any two Mendelian recessive disorders in humans.

Ans. Haemophilia / colour blindness / cystic fibrosis / Thalassemia / sickle cell anaemia/ phenylketonuria (any two) = ½ + ½ [1 Mark]

3. Why is DNA replication termed as semi-conservative?

Ans. After replication each DNA contains one parental strand and one newly synthesized strand = ½ + ½

(one strand of previous generatation conserved) [1 Mark]

4. Name the virus which causes one of the most common human ailments - the common cold.

Ans. Rhino virus [1 Mark]

5. Mention the role of 'Ori' in a cloning vector.

Ans. Replication of (linked) DNA starts at 'Ori' ,

controls the copy number of DNA = ½ + ½ [1 Mark]

SECTION B

Q.Nos. 6 - 10 are of two marks each

6. How does CuT act as a contraceptive?

Ans. CuT releases Cu-ions which supress sperm motility, fertilizing capacity of sperm = 1 + 1 [2 Marks]

OR

Mention the changes the zygote of fungi undergo before they develop into new individuals. Why do these changes take place?

Ans. Zygote develops a thick (resistant) wall = 1

These changes take place to avoid dessication, damage = ½ + ½ [2 Marks]

7. Mention the pattern of inheritance of human skin colour: How does it deviate from that of Mendelian pattern of inheritance?

Ans. Polygenic (quantative) inheritance / controlled by multiple (many) genes = 1

Skin colour does not show distinct alternate forms / spreads across a gradient (unlike mendelian trait) / effect of each allele is additive = 1 [2 Marks]

8. List any four characters that the plant breeders have tried to incorporate into crop plants so as to increase the crop yield.

Ans. Improved quality, increased tolerance to environmental stresses (heat / salinity / drought), resistance to pathogens (virus; fungi, bacteria), increased tolerance to pests = ½ x 4 [2 Marks]

9. Name the bioactive molecule that is used as immuno-suppressive agent and its source organism.

Ans. Cyclosporin A, *Trichoderma polysporum* = 1 + 1 [2 Marks]

10. Name and explain the association that exists between cattle-egret and the cattle.

Ans. Commensalism = 1

The egret is benefitted (by getting insects as food flushed out from the vegetation which gets stirred up due to grazing by cattle), cattle is neither harmed nor benefitted = ½ + ½ [2 Marks]

SECTION C

Q.Nos. 11 - 22 are of three marks each

11. How is parthenogenesis different from parthenocarpy ? Mention one example of each.

Ans. Parthenogenesis is the development of new organism by female gamete without fertilization = 1

eg. male honeybee / drones / lizards / rotifers / turkey (any one) = ½

Parthenocarpy is development of fruit without fertilization = 1

eg. Banana = ½ [3 Marks]

12. State the function of placenta in humans. List the hormones secreted by it.

Ans. Facilitates supply of oxygen / nutrients to the embryo, removal of CO_2 / excretory / waste material produced by the embryo = ½ + ½

Hormones - hCG (human chorionic gonadotrophin), hPL (human placental lactogen), estrogen, progestogen = ½ x 4

[3 Marks]

13. Explain the mechanism of sex-determination in honeybees. What is it called?

Ans. Female honeybee (32 chromosomes) are diploid, produce haploid gametes / eggs (16 chromosomes) through meiosis, Males are haploid (16 chromosomes) / produce haploid gamete through mitosis, Males develop from unfertilized eggs through Parthenogenesis , Females develop from fertilized egg (formed by union of egg and sperm) = ½ x 5

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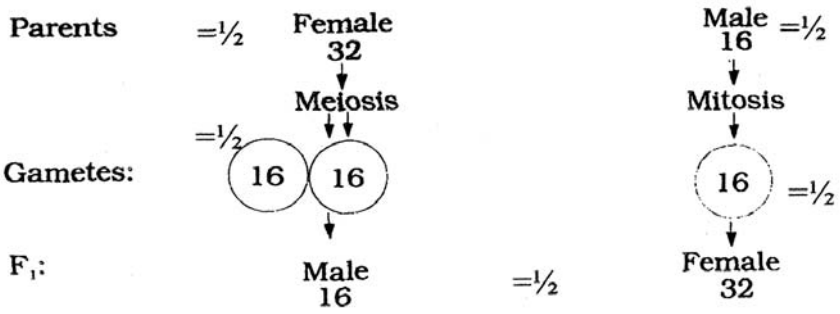
(Same weightage for the graphic representation)



This is known as haplodiploid sex determination system = ½ [3 Marks]

OR

Explain pleiotropy with the help of an example.

Ans. Single gene exhibiting multiple phenotypic expression is called Pleiotropy, = 1

Example - phenylketonuria = ½

Occurs due to mutation of a single gene (coding for phenyl alanine hydroxylase) = ½

Leads to multiple phenotypic expression mental retardation / reduction in hair / skin pigmentation (any two) = ½ + ½

[3 Marks]

14. Name the different types of RNA along with their functions, that take part in the process of translation.

Ans. mRNA / messenger RNA , determines the order and sequence of amino acid in the polypeptide chain and provides the template = ½ + ½

tRNA / transfer RNA , Reads the genetic code and brings the amino acids = ½ + ½

rRNA / ribosomal RNA , forms the structure of ribosomes and catalyses peptide bond formation = ½ + ½

[3 Marks]

15. Study the following traits observed in a human suffering from a genetic disorder :

Short statured, small round head, furrowed tongue and partially open mouth.

Identify this genetic disorder and mention its cause. Write two more characteristics of this disorder.

Ans. Down's syndrome = 1

Due to presence of an additional copy of chromosomes no 21/ trisomy of 21st Chromosome = 1

Broad palm with characteristics palm creases / congenital heart disease / many' loops' on finger tips / mental/psychomotor development is retarded (any two) = ½ + ½

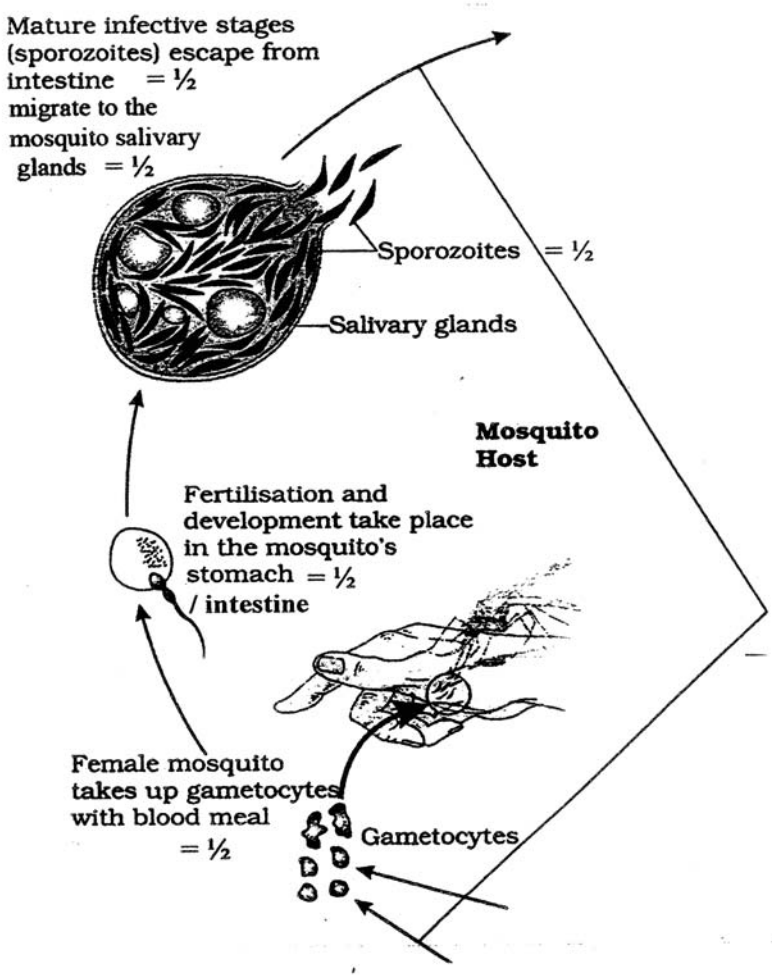
[3 Marks]

16. Trace the stages in the life cycle of *Plasmodium* that takes place in the mosquito. Write the scientific name of the protozoan which causes malignant malaria.

Ans. Female *Anopheles* mosquito if bites the infected human being takes up the gametocytes with the blood meal, fertilization of male & female gametocyctes and development takes place inside the mosquito's intestine, mature infective stages (sporozoites) escape from intestine, migrate to the salivary gland, sporozoite are now ready to be injected into the body of another human being = ½ x 5

//

same weightage to the diagrarnatic representation.



Plasmodium falciparum = 1

[3 Marks]

17. Explain the primary and secondary immune responses produced by our body. Name the type of antibody

(i) present in the colostrum of mother, and

(ii) that is produced in response to an allergen.

Ans. Primary response is a low intensity response shown by the body when it encounters the pathogen for the first time = 1

Secondary response is a high intensity response with repeated (subsequent) exposure to the same pathogen = 1

(i) Ig A = ½

(ii) Ig E = ½

[3 Marks]

18. Write the three common approaches for the treatment of cancer. How are they administered on a patient?

Ans. Common approaches for the treatment of cancer are : -

(i) Surgery or removal of the Cancerous part / tumor from the body = 1

(ii) Radiation Therapy, Tumor cells are irradiated lethally (taking proper, care of surrounding normal tissue) = ½ + ½

(iii) Immuno Therapy (Chemotherapy) , Chemo-therapeutic drugs are used to kill the cancerous cells = ½ + ½

[3 Marks]

19. How does a restriction endonuclease function ? Name a restriction endonuclease and write the specific sequence of bases that it recognizes.

Ans. Restriction endonuclease inspects the length of the DNA sequence, binds to the specific recognition sequence / palindromic sequence, cuts the strand of DNA at

specific point in the sugar phosphate bond (a little away from the centre), between the same two bases on the opposite strands leaving single stranded overhanging stretches called sticky ends = ½ x 4

Restriction Endonuclease = EcoRI = ½

Recognition sequence $\left.\begin{matrix} 5' - G\downarrow AATTC - 3' \\ 3' - CTTAA\uparrow G - 5' \end{matrix}\right\} = ½$

[3 Marks]

20. How did Eli Lilly, using rDNA technique, make it possible to treat diabetic patients with human insulin ? Explain.

Ans. Mature human insulin consists of two short polypeptide chains A & B, Eli Lily prepared two DNA sequences corresponding to chain A & B, introduced them in the palsmids of E. coli (to produce insulin chains), chains A & B were produced separately, extracted and combined, by creating disulphide bonds to form human insulin = ½ x 6 = 3

[3 Marks]

21. Biotechnology has played an important role in developing boll worm resistant cotton plants. Explain how such cotton plants are developed and made resistant to boll worm.

Ans. Some strains of *Bacillus thuringiensis*, produce insecticidal proteins that kill bollworm, this protein is encoded by cry gene II Ab / cry I Ac , this gene was isolated from the bacteria *(Bacillus thuringiensis)*, incorporated into cotton plant, thus making the plant resistant to bollworm = ½ x 6

[3 Marks]

22. Name and explain the naturally occurring phenomenon responsible for heating of Earth's surface and its atmosphere. State how this phenomenon is responsible for global warming.

Ans. Green House effect = ½

Half of the solar radiations entering the earth helps in heating it, the surface re-emits heat in the form of infra red radiation, part of this heat does not escape (into the space) and gets absorbed by green house gases CH_4 / methane and CO_2 / carbon dioxide , these gases radiate the heat back to the earth keeping it warm = ½ x 4

Increase in the level of green house gases has led to considerable heating of the earth thus causing global warming = ½

[3 Marks]

SECTION D

Q.Nos. 23 is of four marks

23. Indiscriminate human activities are one of the major reasons in causing imbalance in the environment. You, as a member of an eco-club of your school, are participating in "Save your environment" programme, organized by the cluster-schools in your neighbourhood. Why is there a dire need to organize such programmes ? List any three activities that you would suggest and plan to organize for this programme. Give reasons for each one of the activities.

Ans. We need to organise such programmes as indiscriminate human activities are affecting the environment adversely and causing threat to the survival of the man and other living beings / indiscriminate use of resources is leading to destruction of the environment / to maintain sustainable utilization of bio resources / judicious use of natural resources (or any other appropriate reason) = 1

Activities -

(i) Plantation drive- to purify the environment / maintaining hydrological cycles / preventing soil erosion / maintain temperature or any other

(ii) 'Say no to plastic' campaign' - To reduce the use of non-biodegradable substances and promote the use of biodegradable substances

(iii) Segregation of wastes- To segregate the garbage produced in the school into biodegradable , non biodegradable and recyclable components

(iv) Judicious use- of water, electricity, paper etc. to conserve the natural resources Or any other relevant activity (any three) 1 x 3

[4 Marks]

SECTION E

Q.Nos. 24 - 26 are of five marks each

24. (a) Self-pollination ensures seed formation yet cross pollination is preferred. Explain giving reasons.

(b) Explain any three outbreeding devices adopted by flowers In angiosperms.

Ans. (a) Cross pollination is preferred as it adds new characteristics, creates genetic variations, leads to the formation of improved varieties, prevents inbreeding depression (any two) = 1 + 1

(b) Outbreeding devices: -

(i) Pollen release and stigma receptivity of the same flower is not synchronized - (takes place at diffrent time)

(ii) Anther and stigma are placed at different positions - so that pollens do not come in contact with stigma of the same flower

(iii) Self - incompatibility - pollen from the same flower do not germinate on the pistil of the same or other flowers of the same plant

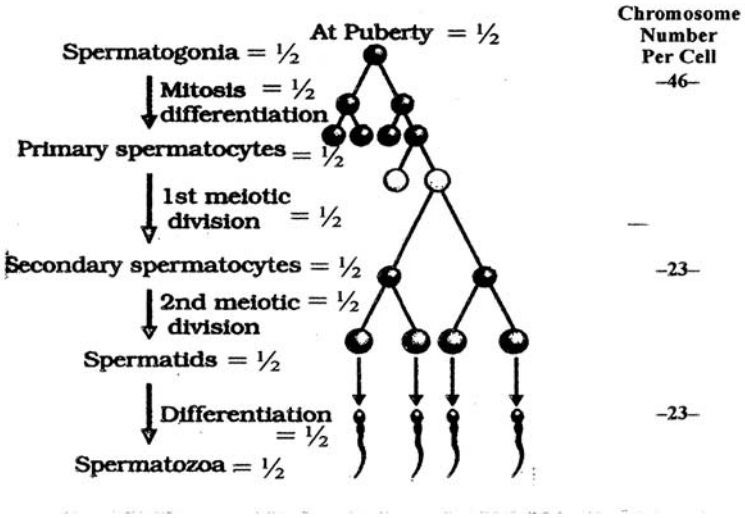
(iv) Production of unisexual flowers - It prevents autogamy (in monoecious plants) but not Geitonogamy

(Any three) = 1 + 1 + 1

[5 Marks]

OR

Explain the process of spermatogenesis in humans.



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At puberty, spermatogonia (present in the seminiferous tubules), mutilply by mitotic division,to produce diploid primary spermatocycte, which undergoes first meiotic division, to form two haploid secondary spermatocytes , these further undergo second meiotic division, to produce four equal haploid spermatids , which are transformed or differentiated (spermiogenesis) , into spermatozoa = ½ x 10

[5 Marks]

25. Explain the salient features of double-helix DNA strand.

Ans. (i) DNA is made of two complementary polynucleutide chains

(ii) Each nucleotide contains a nitrogenous base (Adenine, Guanine, Cytosine, Thymine) linked with de-oxyribose sugar (by glycosidic linkage) which is attached to phosphate group by (phosphoester bond)

(ii) Two chains have antiparallel polarity (i.e one has 5' -3' polarity and other has 3' -5' polarity)

(iv) The bases in the strands are paired through hydrogen bonds forming base pairs

(v) Adenine pairs with Thymine with double hydrogen bond and Cytosine pairs with Guanine with triple hydrogen bonds and vice-versa.

(vi) Both the chains are coiled in a right handed fashion

(vii) The pitch of helix is 3.4 nm.

(viii) There are 10 base pairs in each turn

(ix) The distance between a base pair in the helix is 0.34nm.

(x) The plane of one base pair stacks over the other in a double helix = ½ x 10

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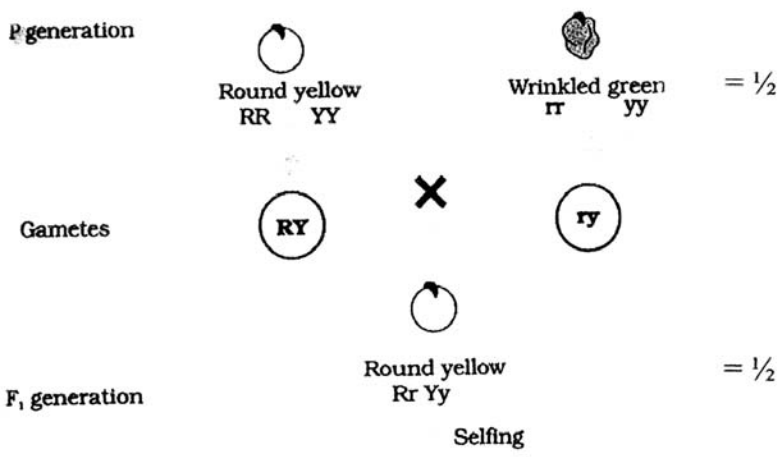
Diagram of DNA helix depicting all the above ten value points

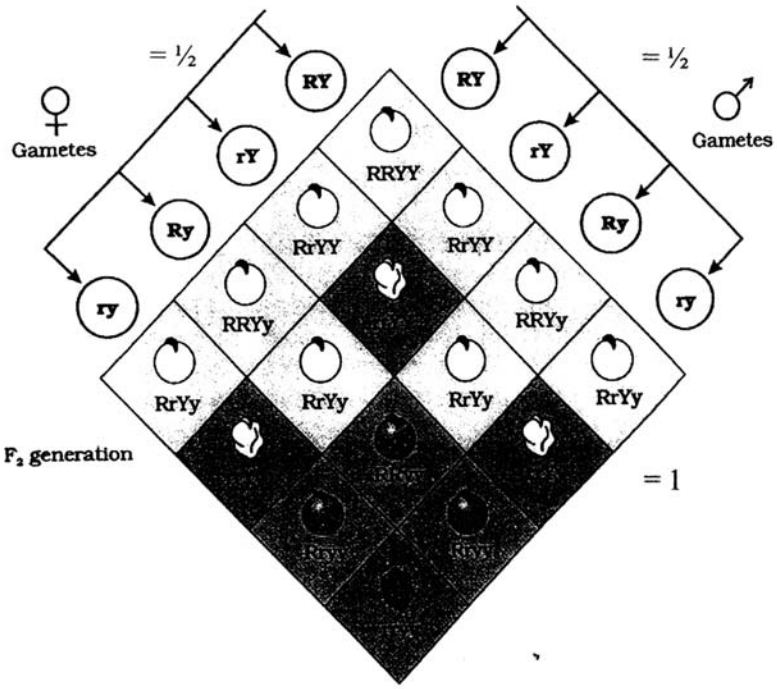
[5 Marks]

OR

Work out a typical Mendelian dihybrid cross and explain how Mendel derived the Law of Independent Assortment from such a cross.

Ans.





Inference- In a dihyhrid cross two pairs of traits (round and yellow seeds and wrinkled and green seeds) when combined in a hybrid, segregated from each other in an independent manner get assorted in offsprings (appearance of new combinations of yellow wrinkled seeds and green round seeds) = 1

[5 Marks]

26. (a) Explain an ecological pyramid of numbers.

(b) Pyramids are mostly upright, but sometimes exceptions do occur. Why? Explain with the help of an example.

Ans. (a) Ecological pyramids of number is a diagrammatic representation showing relationship between organisms at different trophic levels in terms of their number = 1

The pyramid of number which is usually upright has a broader base representing larger number of primary producers, narrows down at the apex as the number of organisms at each trophic level decreases = ½ + ½

(b) Exceptions: (Inverted pyramid)

(i) Pyramid of number, at a given time many birds / insects (primary consumers) feeding on single big tree (primary producer) = ½ + 1

Trophic Level		**Number of Individuals**	
PC /	**Insects / Birds**	**100**	½
Primary Consumers			½
PP/	**Tree**	**1**	
Primary Producers			

(For Correct Diagram) = ½

= ½ x 3

//

(i) Pyramid of biomass ,at a given time in the sea the biomass of fish / zooplankton (primary consumers) is more than that of phytoplanktons (primary producers) = ½ + 1

Trophic Level		**Biomass of Individuals**	
PC /	**Fishes**	**21**	= ½
Primary Consumers			= ½
PP/	**Phytoplankton**	**4**	
Primary Producers			

(For Correct Diagram) = ½

= ½ x 3

[5 Marks]

OR

You have read about Ahmed Khan, a plastic sack manufacturer and of his innovative idea of plastic waste management. Describe his effort and of the people who joined him and how they were benefitted.

Ans. (i) Ahmed Khan developed polyblend , a fine powder of recycled modified plastic film waste

(ii) This mixture was mixed with bitumen that is used to lay roads

(iii) R.Y. College of Engineering and Banglore City Corporation joined him and found that combination of polyblend and bitumen enhanced bitumen's water repellant properties and helped to increase the road life

(iv) More than 40 km of road has been laid with this polyblend

(v) Ahmed Khan helped the rag pickers by giving them better price for plastic film waste (Rs. 6.0 instead of Rs. 0.40 per kg)

= l x 5

[5 Marks]