

Solved Paper 2016

BIOLOGY

Time : 3 Hours

Class-XII

Max. 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 1 mark each.
- (iii) Section B contains question number 6 to 10, short answer type-I questions of 2 marks each.
- (iv) Section C contains question number 11 to 22, short answer type-II questions of 3 marks each.
- (v) Section D contains question number 23, value based question of 4 marks.
- (vi) Section E contains question number 24 to 26, long answer type questions of 5 marks each.
- (vii) There is no overall choice in the question paper, however, an internal choice is provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks. In these questions, an examinee is to attempt any one of the two given alternatives.

Delhi Set I

Code No. 57/1/1

SECTION - A

1. According to de-Vries what is saltation? 1

Ans. Single step (large) mutation. 1
[CBSE Marking Scheme, 2016]

Detailed Answer :

According to de-Vries saltation is a single step large mutation which leads to speciation.

- * 2. Excessive nutrients in a fresh water body cause fish mortality. Give two reasons. 1
- * 3. Suggest the breeding method most suitable for animals that are below average in milk productivity. 1
4. State a difference between a gene and an allele. 1

Ans. Gene - contains information that is required to express a particular trait // unit of inheritance // segment of DNA called cistron // sequence of DNA coding for tRNA / rRNA / polypeptide / enzyme.

Allele - Genes which code for a pair of contrasting traits / (slightly) different forms of the same gene / individual gene in a particular gene pair (for same character). 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

| Gene | Allele |
|---|---|
| A gene is a portion of DNA that determines a certain trait. | An allele is a specific form of a gene. |
| Genes do not occur in pairs. | Alleles occur in pairs. |
| Genes are responsible for the expression of traits. | Alleles are responsible for the variations in which a given trait can be expressed. |
| Examples : Eye colour, hair colour | Examples : Blue eyes, blonde hair |

5. Suggest a technique to a researcher who needs to separate fragments of DNA. 1

Ans. (Gel) electrophoresis. 1
[CBSE Marking Scheme, 2016]

Detailed Answer:

A technique to separate fragments of DNA is Gel electrophoresis. In this technique DNA molecules are separated using electric field. DNA being negatively charged moves towards anode through a matrix.

SECTION - B

* 6. Explain the significance of meiocytes in a diploid organism. 2

7. Mention the kind of biodiversity of more than a thousand varieties of mangoes in India represent. How is it possible? 2

Ans. Genetic diversity / single species show high diversity at genetic level. 1

Single species show high diversity at genetic level over its distributional range / different varieties grow in different geographical areas / climatic conditions / breeding / mutations. 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

India lies within tropical latitudes giving it a constant and predictable environment, the difference of soil in different area, different agricultural practices and use of horticulture techniques like grafting ,breeding in different areas.

8. List the events that reduce the Biological Oxygen Demand (BOD) of a primary effluent during sewage treatment. 2

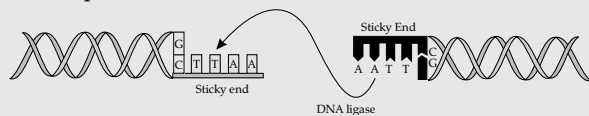
Ans. Effluent from the primary settling tank passed into aeration tank, agitated mechanically and air is pumped into it, vigorous growth of aerobic microbes into flocs, microbes consume major part of the organic matter in effluent. ½ × 4

[CBSE Marking Scheme, 2016]

9. Discuss the role the enzyme DNA ligase plays during DNA replication. 2

Ans. (Discontinuous) DNA fragments, are joined / sealed by them // sticky ends of vector and foreign DNA, joined by them.

The following diagram can be considered in lieu of explanation.



1 + 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

During replication, discontinuously synthesised fragments at the lagging strand are joined with the help of enzyme, DNA ligase. Ligase helps in the joining of two DNA strands

For diagram: Refer above CBSE Marking Scheme answer.

10. Name the causative organism of the disease amoebiasis. List three symptoms of the disease. 2

* OR

| Crop | Variety | Resistance to disease |
|-------------|--------------|-----------------------|
| A | Himgiri | Leaf rust |
| Cauliflower | Pusa Shubhra | B |
| Brassica | Pusa Swarnim | C |
| Cowpea | D | Bacterial blight |

Ans. Causative Organism - *Entamoeba histolytica*. ½

Symptoms - Constipation, abdominal pain, cramps, stool with excess mucous / blood clots.

(Any three) ½ × 3

SECTION - C

11. Why is breast-feeding recommended during the initial period of an infant's growth? Give reasons. 3

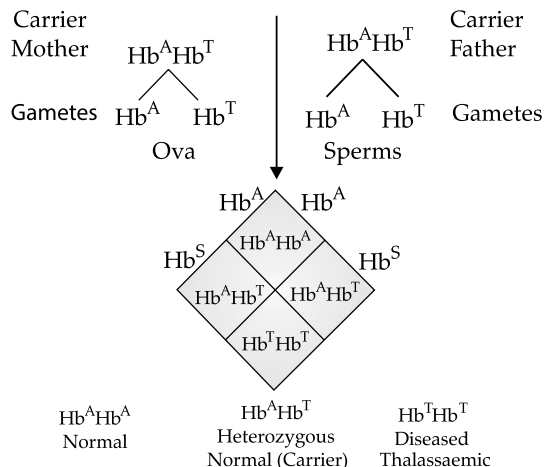
Ans. Colostrum, rich in nutrients, rich in antibodies / rich in IgA / provide passive immunity/ provides immunity to new born / helps to develop resistance in new born / readily available for new born / hygienic / develops a bond between mother and child.

(Any three) 1 × 3

[CBSE Marking Scheme, 2016]

12. Give an example of an autosomal recessive trait in humans. Explain its pattern of inheritance with the help of a cross. 3

Ans. Thalassaemia is an example of autosomal recessive trait in humans.

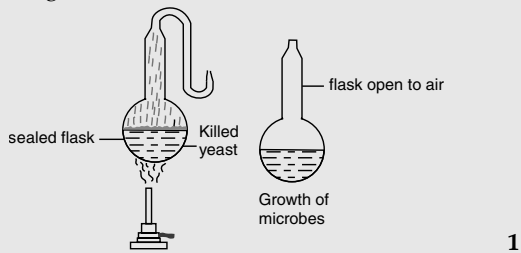


The disease is controlled by a single pair of allele Hb^A and Hb^T . The disease is only expressed if both the copies are defective. People with a single defective copy of the gene are clinically normal, however, they can pass on the defective gene to their next generations

13. Describe the experiment that helped Louis Pasteur to dismiss the theory of spontaneous generation of life. 3

Ans. Two pre sterilised flasks with killed yeast, one sealed, other open to air, differential growth of life in two flasks/life was found only in open flask.

The following diagram can be considered in lieu of above explanation life comes from pre-existing life (it came from air entering the flask)/proved the theory of biogenesis. $\frac{1}{2} \times 4$

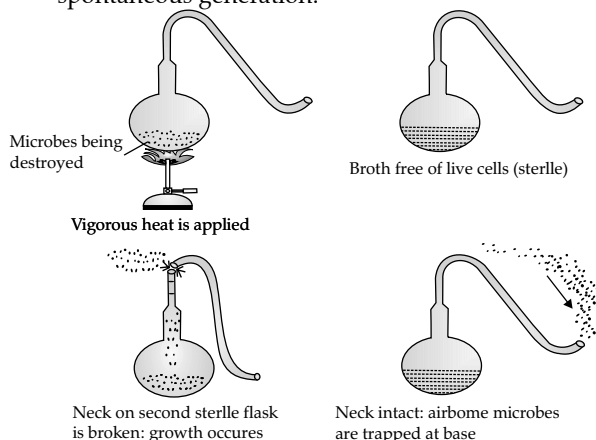


[CBSE Marking Scheme, 2016]

Detailed Answer:

Louis Pasteur dismissed the theory of spontaneous generation of life and suggested that life is propagated only through pre-existing life forms through the swan-necked flask experiment.

He carried out his experiment in two swan-necked flasks containing nutrient broth. The broth in the both flask was boiled to kill any existing microbes and was made sterile. The swan neck of one of the sterilized glass was broken and the flask was left undisturbed in the open air for some time. After some time the dust particles along with bacteria in the air entered the flask with broken neck and got accumulated at the neck of the unbroken flask. The broth in the broken flask became cloudy, indicating the presence of microbial life while the broth in the unbroken flask remain clear. Appearance of life even after sterilisation, in the broken flask concluded that life in the flask arose only from pre-existing life. Thus, the experiment discarded the theory of spontaneous generation.



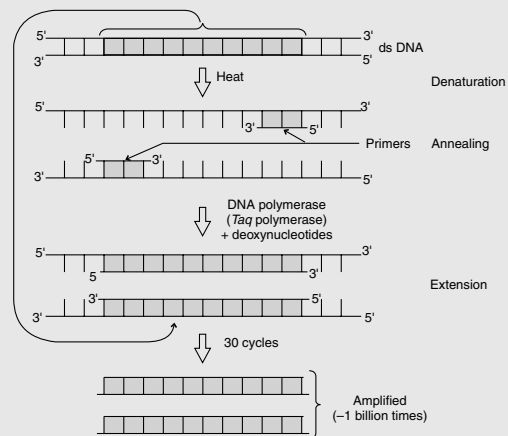
- * 14. Plant breeding technique has helped sugar industry in North India. Explain how. 3

15. Suggest and describe a technique to obtain multiple copies of a gene of interest *in vitro*. 3

Ans. PCR / polymerase chain reaction. 1

Separation / denaturation of two strands of two dsDNA, using two sets of primers / small chemically synthesised oligonucleotides complementary to regions of DNA and (thermostable) DNA polymerase / Taq polymerase, extension of the primers, by enzyme using nucleotides replicates the DNA and if the process of replication is repeated many times multiple copies of DNA are produced. 2

(The following diagram can be considered in view of the explanation).



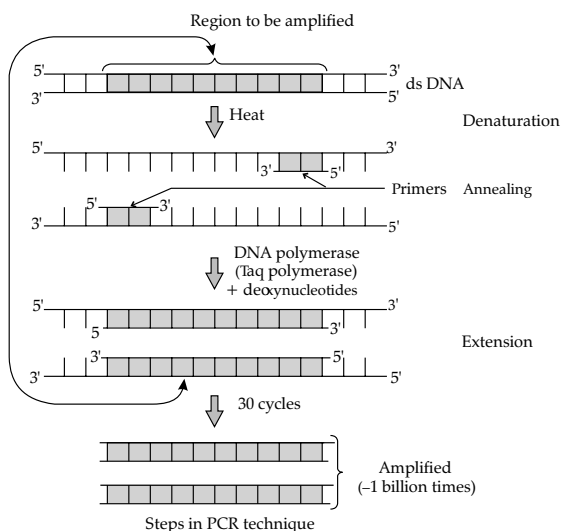
[CBSE Marking Scheme, 2016]

Detailed Answer:

PCR (Polymerase Chain Reaction) is a technique in molecular biology, used to amplify a gene or a piece of DNA to obtain its several copies. It is extensively used in the process of gene manipulation.

Steps in PCR technique:

- (a) **Denaturation:** Here, the double stranded DNA is denatured using high temperature to form single strand to act as a template for DNA synthesis.
- (b) **Annealing of Primers:** Two sets of primers are annealed or hybridized at low temperature using suitable enzymes based on the length and the sequence of the primers.
- (c) **Extension of Primers:** The primers are extended by adding nucleotides complementary to the template by Taq DNA polymerase.



By repeating the process of replication, many times multiple copies of DNA are produced

16. What is a GMO? List any five possible advantages of a GMO to a farmer. 3

Ans. Plants/bacteria/fungi/animals whose genes have been altered by manipulation. 1/2

Tolerance to abiotic stresses / like cold / drought / salt/ heat, reduced reliance on chemical pesticides / pest resistant crops, reduce post harvest losses, increased efficiency of mineral usage by plants, enhanced nutritional value, to create tailor made plant. (Any five) 1/2 × 5

[CBSE Marking Scheme, 2016]

- * 17. During a school trip to 'Rohtang Pass', one of your classmate suddenly developed 'altitude sickness'. But, she recovered after sometime.

- (a) Mention one symptom to diagnose the sickness.
 (b) What caused the sickness?
 (c) How could she recover by herself after sometime? 3

- * 18. How has RNAi technique helped to prevent the infestation of roots in tobacco plants by a nematode *Meloidogyne incognita*? 3

19. "In a food-chain, a trophic level represents a functional level, not a species." Explain. 3

OR

- * (a) Name any two places where it is essential to install electrostatic precipitators. Why it is required to do so?
 * (b) Mention one limitation of the electrostatic precipitator.

Ans. Position of a species in any trophic level is determined by the function performed by that mode of nutrition of species in a particular food chain / A given species may occupy more than one

trophic level in the same ecosystem (in different food chains) at the given time, If the function of the mode of nutrition of species changes its position shall change in the trophic levels, same species can be at primary consumer level in one food chain and at secondary consumer level in another food chain in the same ecosystem at the given time. Similar value points explained with the help of a suitable example. 1 × 3

[CBSE Marking Scheme, 2016]

20. Prior to a sports event blood & urine samples of sportspersons are collected for drug tests.

- (a) Why is there a need to conduct such tests?
 (b) Name the drugs the authorities usually look for.
 (c) Write the generic names of two plants from which these drugs are obtained. 3

Ans. (a) To detect drug abuse / use of banned drugs/ use of cannabinoids / anabolic steroids / narcotic analgesic / diuretics/ hormones/ drugs used to accelerate performance / increase muscle strength / bulk / promote aggressiveness / to ensure fair game.

(b) Cannabinoids / cocaine / coca alkaloid/ coke / crack / hashish / charas / ganja / hemp plant extract.

(c) Cannabis / Atropa / Erythroxyllum / Datura (Any two) 1 × 3

[CBSE Marking Scheme, 2016]

Detailed Answer:

(a) The blood test is conducted to check the level of certain drugs in the blood which are banned by sports authorities.

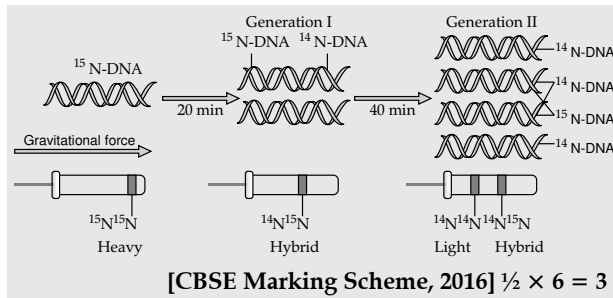
(b) Authorities look for certain drugs like narcotic analgesics, anabolic steroids, diuretics and certain hormones.

(c) The generic name of the plants from which drugs are obtained are *Cannabis sativa*, and *Papaver somniferum*.

21. Describe the experiment that helped demonstrate the semi-conservative mode of DNA replication. 3

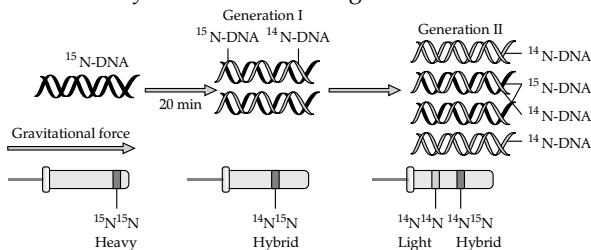
Ans. Grown *E.coli* in $^{15}\text{NH}_4\text{Cl}$ for many generations to get ^{15}N incorporated into DNA, Then the cells are transferred into $^{14}\text{NH}_4\text{Cl}$, The extracted DNA are centrifuged in CsCl and measured to get their densities, DNA extracted from the culture after one generation (20 minutes), showed intermediate hybrid density, DNA extracted after two generations (40 minutes) showed light DNA and hybrid DNA.

A correctly labelled diagrammatic representation in lieu of the above explanation of experiment to be considered.

**Detailed Answer:**

The replication of DNA semi-conservatively was shown first in *Escherichia coli*. Matthew Meselson and Franklin Stahl performed the following experiment in 1958:

- They grew *E. coli* in a medium containing $^{15}\text{NH}_4\text{Cl}$ in which ^{15}N is the heavy isotope of nitrogen. This resulted ^{15}N to synthesize new DNA. This heavy DNA molecule could be distinguished from the normal DNA by centrifugation in a cesium chloride (CsCl) density gradient.
- Then they transferred the cells into a medium with normal $^{14}\text{NH}_4\text{Cl}$ and took samples at various definite time intervals as the cells multiplied, and extracted the DNA that remained as double-stranded helices. The various samples were separated independently on CsCl gradients to measure the densities of DNA.
- The DNA extracted from the culture one generation after the transfer from ^{15}N to ^{14}N medium had a hybrid or intermediate density. DNA extracted from the culture after another generation was composed of equal amounts of the hybrid DNA and of 'light' DNA.



22. Given below is a list of six micro-organisms. State their usefulness to humans. 3

- Nucleopolyhedrovirus*
- Saccharomyces cerevisiae*
- Monascus purpureus*
- Trichoderma polysporum*
- Penicillium notatum*
- Propionibacterium shermanii*

Ans. (a) As bio control agents / species specific / narrow spectrum insecticidal application / no negative impacts on plants / mammals / birds / fish / non target insects / Integrated Pest Management.

- Used in bread making / brewing industry / ethanol / CO_2 production.
- Cholesterol lowering agent / competitively inhibiting the enzyme responsible for synthesis of cholesterol.
- Produces Cyclosporin-A/immunosuppressive agent.
- Produces antibiotic penicillin.
- Produces large holes in Swiss cheese / produces large amount of CO_2 in swiss cheese. $\frac{1}{2} \times 6$

[CBSE Marking Scheme, 2016]

SECTION - D

23. Reproductive and Child Healthcare (RCH) programmes are currently in operation. One of the major tasks of these programmes is to create awareness amongst people about the wide range of reproduction related aspects. As this is important and essential for building a reproductively healthy society.

- "Providing sex education in schools is one of the ways to meet this goal. Give four points in support of your opinion regarding this statement.
- List any two 'indicators' that indicate a reproductively healthy society. 4

- Ans. (a) Provide right information to the young so as to discourage children from believing in myths and misconception about sex related aspects.
- Proper information about reproductive organs
 - Proper information about adolescence and related changes
 - Safe hygienic practices
 - STDs / AIDS
 - Available birth control options
 - Care of pregnant mothers
 - Post natal care
 - Importance of breast feeding
 - Equal opportunities for male and female child
 - Awareness of problems due uncontrolled population growth
 - Sex abuse
 - Sex related crimes (Any four) $\frac{1}{2} \times 4$
- (b) Better awareness about sex related matters / increase number of assisted deliveries / better post natal care / decrease in IMR (Infant Mortality Rate) / decrease MMR (Maternal Mortality Rate) / increase number of couples with small families / better detection and cure of STDs / overall increased medical facilities for sex related problems / total well being in all

aspects of reproduction / physical - behavioural - social / physically and functionally normal reproductive organs / normal emotional and behavioural interaction among all sex related aspects.

(Any two) 1 + 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

Providing proper sex education in schools :

- (i) Discourage children from believing in myths and having misconceptions about sex-related aspects.
 - (ii) Proper and correct information about reproductive organs adolescence and related changes, safe sexual practices and sexual hygiene help the adolescents lead a healthy reproductive life.
3. Information about sexually transmitted diseases and HIV-AIDS is important for turning adolescents into responsible adults
4. Awareness of problem due to uncontrolled population growth, social evils like sex abuse and sex related crimes etc. need a healthy society.
- (b) The two indicators that indicate a reproductively healthy society are:
- (i) Correct ratio of male and female individuals as there is no emphasis on a selection of a particular sex.

SECTION - E

24. (a) Explain the post-pollination events leading to seed production in angiosperms. 3
- (b) List the different types of pollination depending upon the source of pollen grain. 2
- OR
- (a) Briefly explain the events of fertilization and implantation in an adult human female. 3
- (b) Comment on the role of placenta as an endocrine gland. 2

Ans. (a) Pollen pistil interaction, germination of pollen tube that carries two male gametes, double fertilization / syngamy and triple fusion, development of endosperm, development of embryo, maturation of ovule into seed.

$$\frac{1}{2} \times 6 = 3$$

- (b) Autogamy / self pollination / Geitonogamy 1
Xenogamy / cross pollination. 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) After entering one of the synergids, the pollen tube releases the two male gametes into the cytoplasm of the synergid. One of the male gametes moves towards the egg cell and fuses

with its nucleus thus completing the syngamy. This results in the formation of a diploid cell, the zygote. The other male gamete moves towards the two polar nuclei located in the central cell and fuses with them to produce a triploid primary endosperm nucleus (PEN). As this involves the fusion of three haploid nuclei it is termed triple fusion. Since two types of fusions, syngamy and triple fusion take place in embryo sac, the phenomenon is termed double fertilisation.

Endosperm development precedes embryo development. The triploid primary endosperm nucleus (PEN) undergoes repeated mitotic divisions, without cytokinesis. At this stage of development, the endosperm is called free-nuclear endosperm. The cells of the endosperm store food materials, which are later used by the developing embryo.

The endosperm may be completely utilized by the developing embryo before the maturation of seeds as in pea, bean, groundnut etc. in non-albuminous or non-endospermic seeds. In albuminous or endospermic seeds, a portion of endospermic may remain in the mature seeds. e.g., castor.

(b) There are three types of pollination namely : autogamy, geitonogamy and xenogamy.

- (i) Autogamy: It is the process of transferring the pollen grains from the anther to the stigma of the same flower. It is a self pollination.
- (ii) Geitonogamy: It is the process of transferring the pollen grains from the anther to the stigma of another flower of the same plant. It is functionally cross-pollination involving a pollinating agent, but genetically similar to autogamy since the pollen grains come from the same plant.
- (iii) Xenogamy: It is the process of transferring the pollen grains from anther to the stigma of a different plant. It is a cross-pollination.

OR

Ans. (a) Fertilization:

- i. Sperm comes in contact and enters the secondary oocyte/
- ii. activates / induces secondary oocyte to complete meiosis II leads to formation of ovum / ootid/
- iii. the haploid nucleus of sperm and that of ovum fused to form a diploid zygote completing the process of fertilization/

$$\frac{1}{2} \times 3$$

Implantation:

- i. Trophoblast layer of blastocyst attaches to the endometrium (of the uterus).
- ii. The uterine cells divide rapidly and cover the blastocyst.

- iii. The blastocyst becomes embedded in the endometrium and the implantation is completed. $\frac{1}{2} \times 3$
- (b) i. HCG (human chorionic gonadotropin)
 ii. HPL (human placental lactogen)
 iii. estrogen
 iv. progesterone $\frac{1}{2} \times 4$
- [CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) The events of fertilization and implantation in an adult human female are as follows:
- On the 14th day of menstrual cycle, ovulation takes place which releases secondary oocyte.
 - This secondary oocyte is caught by fimbriae and it starts moving up the fallopian tube.
 - In the meantime, sperm which has been deposited in vagina will start moving up and reach the fallopian tube.
 - The two gametes meet at ampullary isthmus junction and fuse together.
 - After entry of sperm, secondary oocyte completes its meiosis II, changes the ovum and fuse with sperm pronuclei leading to zygote formation.
 - This zygote after sometime starts dividing. It changes to morula (8-16 celled), which continues to divide to form the blastocyst. The morula moves further into the uterus.
 - The cells in the blastocyst are arranged into an outer trophoblast and an inner cell mass.
 - The trophoblast gets attached to the uterine endometrium and the process is called implantation. This leads to pregnancy. The inner cell mass gets differentiated to form the embryo.

- (b) Placenta as endocrine gland produces :
- HCG (Human Chorionic Gonadotropin)
 - HPL (Human Placental Lactogen)
 - Oestrogen
 - Progesterone
 - In the later stages of pregnancy, it also releases relaxin. These hormones support foetal growth and help in maintaining pregnancy.

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

- Histone octamer, 3
- Nucleosome, 3
- Chromatin 3

(b) Differentiate between Euchromatin and Heterochromatin. 2

OR

Explain the role of lactose as an inducer in a lac operon. 5

- Ans. (a) (i) Eight molecules of (positively charged basic proteins called) histones are organised to form histone octamer.
 (ii) Negatively charged DNA wrapped around positively charged histone octamer to give rise to nucleosome.
 (iii) Nucleosome constitute the repeating unit of a structure called chromatin. 1×3

(b)

| S. No. | Euchromatin | Heterochromatin |
|--------|---------------------------|-----------------------------|
| 1. | Loosely packed. | Densely packed. |
| 2. | Stains light. | Stains dark. |
| 3. | Transcriptionally active. | Transcriptionally inactive. |

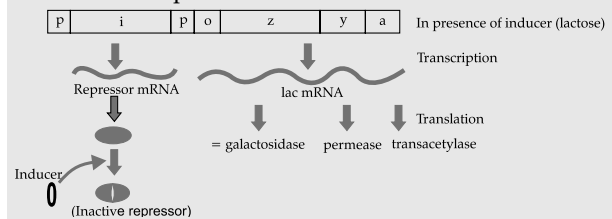
(Any two differences) 1+1
 [CBSE Marking Scheme, 2016]

Detailed Answer:

(b)

| Euchromatin | Heterochromatin |
|---|---|
| In a nucleus, some regions of chromatin are loosely packed and stain light. These are referred to as euchromatin. | The chromatin that is more densely packed and stains dark are called heterochromatin. |
| It is transcriptionally active chromatin. | Heterochromatin is inactive. |

Ans. Lactose / inducer binds with repressor protein, inactivates it, frees operator gene, RNA polymerase freely move over structural genes / RNA polymerase access to the promoter, transcribing to lac mRNA, which on translation, produce transacetylase, permease, β -galactosidase. The following diagram to be considered in lieu of above explanation



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

[CBSE Marking Scheme, 2016]

Detailed Answer:

In lac operon, when lactose is added, it enters the cell with the help of permease, a small amount of which is already present in the cell. Lactose binds itself to active repressor and changes its structure.

The repressor now fails to bind to the operator. Then RNA polymerase starts transcription of operon by binding to the promoter site P. All the three enzymes; transacetylase, permease and β -galactosidase for lactose metabolism are synthesized. Finally all the lactose molecules are used up in the whole process of induction. (It can be understood by the above mentioned figure.)

26. (a) Why should we conserve biodiversity? How can we do it? 2

(b) Explain the importance of biodiversity hot-spots and sacred groves. 3

OR

(a) Represent diagrammatically three kinds of age-pyramids for human populations. 3

(b) How does an age pyramid for human population at given point of time helps the policy-makers in planning for future? 2

Ans. (a) (i) Narrowly utilitarian - related examples like derive economic benefits from nature food (cereals, pulses, fruits) / firewood / fibre / construction materials / industrial products (tannins, lubricants, dyes, resins, perfumes) / product of medicinal importance / drugs. $\frac{1}{2}$

Ethical - millions of species (plants, animals, microbes) share this planet / we need to realise that every species has an intrinsic value (even if it may not current or any economic value to us) / we have a moral duty to care for their wellbeing and

pass on our biological legacy to future generations.

(ii) In situ conservation / biosphere reserves / national parks / sanctuaries / sacred groves. $\frac{1}{2}$

Ex situ conservation / zoological parks / botanical gardens / wild life safari parks / cryopreservation / seed banks / tissue culture (eggs *in vitro*) $\frac{1}{2}$

(b) Hot spots - regions with high level of species richness, high degree of endemism. $1 + 1 + 1$

Sacred groves - tracts of forest containing tree / wild life were venerated and given total protection // to protect last refuges for a large number of rare, and threatened plants. $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

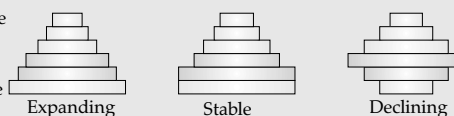
OR

Ans. (a)

Post reproductive

Reproductive

Pre-reproductive



(b) Planning 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 explanation) 1+1

[CBSE Marking Scheme, 2016]

Delhi Set II

Code No. 57/1/2

Note : Except these, all other Questions are from Set I

SECTION - A

3. Give an example of a human disorder that is caused due to a single gene mutation. 1

Ans. Thalassaemia

SECTION - B

* 8. Explain the importance of syngamy and meiosis in a sexual life cycle of an organism. 2

9. List the events that lead to biogas production from waste water whose BOD has been reduced significantly. 2

Ans. Sedimentation of flocs to form activated sludge, sludge pumped to anaerobic sludge digester, growth of anaerobic bacteria, digestion of sludge by bacteria to release biogas. $\frac{1}{2} \times 4$

[CBSE Marking Scheme, 2016]

Detailed Answer:

Events that lead to biogas production from waste water with reduced BOD are :

(i) Once the BOD of waste water is significantly reduced, the effluent is passed into a settling tank for sedimentation.

(ii) From settling tank, the sedimented material called activated sludge (bacterial flocs) is pumped into large tanks called anaerobic sludge digester.

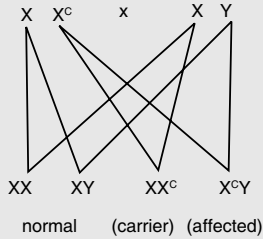
(iii) In these tanks, the sludge is anaerobically treated by bacteria and fungi and biogas is produced which is a mixture of methane, hydrogen sulphide and CO_2 .

* 10. Why the plants that inhabit a desert are not found in a mangrove? Give reasons. 2

SECTION - C

17. A couple with normal vision bear a colourblind child. Work out a cross to show how it is possible and mention the sex of the affected child. 3

Ans.



Affected child is male.

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

[CBSE Marking Scheme, 2016]

* 19. In certain seasons we sweat profusely while in some other season we shiver. Explain.

3

Delhi Set III

Code No. 57/1/3

Note : Except these, all other Questions are from Set I & II

SECTION - A

5. Give an example of a codon having dual function. 1

Ans. AUG. [CBSE Marking Scheme, 2016] 1

Detailed Answer:

Codon AUG have dual function. It functions as an initiating codon and also codes for methionine.

SECTION - B

7. Distinguish between the roles of flocs and anaerobic sludge digesters in sewage treatments. 2

Ans.

| S.No. | Flocs | Anaerobic Sludge Digester |
|-------|---|---|
| 1. | Breakdown organic matter aerobically. | Breakdown organic matter anaerobically. |
| 2. | Breakdown organic matter present in primary effluent. | Breakdown organic matter in secondary effluent. |

(Any two) 1 + 1
[CBSE Marking Scheme, 2016]

* 9. Plants that inhabit a rain-forest are not found in a wetland. Explain 2

* 10. Angiosperms bearing unisexual flowers are said to be either monoecious or dioecious. Explain with the help of one example each. 2

SECTION - C

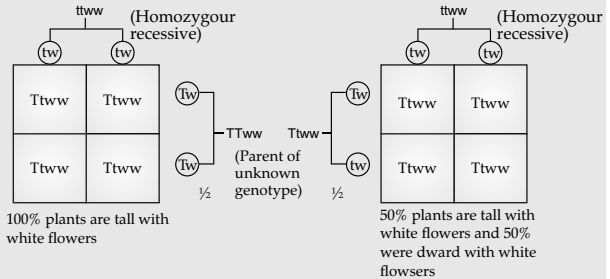
* 13. (a) Name any two fowls other than chicken reared in a poultry farm.

(b) Enlist four important components of poultry farm management. 3

* 18. Explain with the help of suitable examples the three different ways by which organisms overcome their stressful conditions lasting for short duration. 3

22. How would you find genotype of a tall pea plant bearing white flowers? Explain with the help of a cross. Name the type of cross you would use. 3

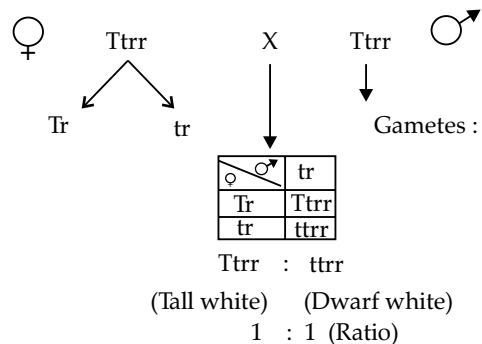
Ans.



- (i) Test cross 1/2
- (ii) Both crosses 1/2
- (iii) Both interpretation 1/2

[CBSE Marking Scheme, 2016] 1 1/2 + 1 1/2

Detailed Answer:



Type of Cross is test cross.

Explanation: Tallness is a dominating trait and can be expressed in heterozygous condition also while recessive traits (in pea) are expressed only in homozygous condition.

So, to find out the genotype of the plant we will cross it with a dwarf pea plant bearing white flowers (as it is homozygous).

If the progeny shows 1 : 1 ratio between dominating and recessive trait, this proves the experimental plant is heterozygous for the dominating trait

SECTION - E

24. Answer the following questions based on Hershey and Chases's experiments:

- (a) Name the kind of virus they worked with and why?
- (b) Why did they use two types of culture media to grow viruses in? Explain.
- (c) What was the need for using a blender and later a centrifuge during their experiments?
- (d) State the conclusion drawn by them after the experiments. 5

OR

- (a) How did Darwin explain adaptive radiation? Give another example exhibiting adaptive radiation.
- (b) Name the scientist who influenced Darwin and how? 5

Ans. (a) Bacteriophage, they infect bacteria. $\frac{1}{2} + \frac{1}{2}$

- (b) Two types of culture media were used in order to make protein of viruses (with the help of ^{35}S) radioactive in one case, and DNA molecule in virus (with the help of ^{32}P) radioactive in other case, $\frac{1}{2} \times 2$

so as to identify which one of the two had entered into the bacteria during viral infection. 1

- (c) **Blender** : to separate the viral protein coats that are still attached to the surface of bacteria. $\frac{1}{2}$

Centrifuge: to separate lighter supernatant (containing viral protein coats) from denser residue (containing bacteria). $\frac{1}{2}$

- (d) DNA is the genetic material *i.e* passed from virus to bacteria. 1

[CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) Hershey and Chase worked with bacteriophage (viruses that infect bacteria), because they have the ability to infect bacteria. When a bacteriophage infects a bacterium, the viral genetic material gets attached with the bacterial genetic material and the bacterium then treats the viral genetic material as its own to synthesise more viral particles.
- (b) They used two types of culture media to grow viruses:

(i) One medium contained radioactive sulphur ^{35}S , so that radioactivity gets incorporated in protein.

(ii) Other medium contained radioactive phosphorus ^{32}P , so that radioactivity gets incorporated in DNA.

(c) Blender was used to remove the viral coats from the bacterial (after infections was done). The viral particles were separated from the bacteria by spinning them in a centrifuge machine.

(d) They observed that bacteria with radioactive DNA were radioactive, while those with radioactive proteins has lost their radioactivity.

This showed that it is the DNA that enters the bacteria from viruses and not proteins. Hence, it was concluded that DNA is the genetic material.

OR

Ans. (a) Darwin observed that from original seed eating features in finches altered beaks arose enabling them to become insectivorous and vegetarian finches. 1

Adaptive radiation - the process of evolution of different species in a given geographical area starting from a point and literally radiating to another areas of geography (habitats). 1

Another example is Australian marsupials / placental mammals in Australia. 1

- (b) Thomas Malthus 1
Population size grows exponentially (due to maximum reproduction), however population size remains limited due to limited natural resources / leading to competition.

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

[CBSE Marking Scheme, 2016]

Detailed Answer:

(a) Darwin during his journey to Galapagos Islands observed that there were many varieties of small black birds later called Darwin's finches.

(i) All the varieties he conjectured, evolved on the island itself.

(ii) From the original seed-eating features, many other forms with altered beaks arose, enabling them to become insectivorous and vegetarian finches.

This process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation.

(b) Australian marsupials and placental mammals. A number of marsupials, each different from the other evolved from an ancestral stock, but all within the Australian island continent. Placental mammals in Australia also exhibit adaptive radiation in evolving into varieties of such placental mammals, each of which appears to

be 'similar' to a corresponding marsupial (e.g., Placental wolf and Tasmanian wolf).

- (b) Work of Thomas Malthus influenced Darwin. He gave an idea about population growth and food

availability. He said that present growth of human population is more than what food population can sustain. This means that many people would die of starvation to level out the population. His views gave the Darwin the idea about "survival of fittest".

Outside Delhi Set I

Code No. 57/2/1

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

Ans. Male Honey bee develops from unfertilized female gamete / unfertilized egg / Parthenogenesis of female gamete (16 chromosomes), female develops by fertilization / fertilized egg (32 chromosomes).
[CBSE Marking Scheme, 2016] $\frac{1}{2} + \frac{1}{2}$

Detailed Answer:

In honey bees an offspring formed from the fusion of a sperm and an egg develops as a female queen or worker and an unfertilized egg develops as a male drone by parthenogenesis.

This shows that the males have half the number of chromosomes than that of female. The females are diploid having 32 chromosomes and males are haploid having 16 chromosomes.

This is called haplodiploid sex determination system.

- * 2. Mention the role of 'genetic mother' in MOET. 1
3. What is biopiracy? 1

Ans. Biopiracy is the use of bioresources by multinational companies and other organization without proper authorization/compensation payment to the concern country / organisation. 1
[CBSE Marking Scheme, 2016]

- * 4. Mention two advantages for preferring CNG over diesel as an automobile fuel. 1
5. Write the probable differences in eating habits of *Homo habilis* and *Homo erectus*. 1

Ans. *Homo habilis* did not eat meat / vegetarian and *Homo erectus* eat meat (meat eater). $\frac{1}{2} \times 2$
[CBSE Marking Scheme, 2016]

SECTION - B

- * 6. A single pea plant in your kitchen garden produces pods with viable seeds, but the individual papaya plant does not. Explain. 2
7. Following are the features of genetic codes. What does each one indicate? Stop codon; Unambiguous codon; Degenerate codon; Universal codon. 2

Ans. The features of genetic code are:

- (a) **Stop codon:** does not code for any amino acid / terminates the synthesis of polypeptide chain.

(b) **Unambiguous codon:** one codon codes for one amino acid only.

(c) **Degenerate codon:** some amino acid are coded by more than one codon.

(d) **Universal codon:** genetic code is same for all organisms (bacteria to humans). $\frac{1}{2} \times 4$

[CBSE Marking Scheme, 2016]

- * 8. Suggest four important steps to produce a disease resistant plant through conventional plant breeding technology. 2
9. Name a genus of baculovirus. Why are they considered good biocontrol agents? 2

Ans. *Nucleopolyhedrovirus* $\frac{1}{2}$
Species specific, narrow spectrum insecticidal application, no negative impact on non target organisms. $\frac{1}{2} \times 3$

[CBSE Marking Scheme, 2016]

Detailed Answer:

Nucleopolyhedrovirus is a genus baculovirus which are considered to be good bio-control agents because these viruses are excellent for species-specific, narrow spectrum insecticidal applications and show no negative impacts on plants, mammals, birds or even non-target insects.

10. * Explain the relationship between CFC's and Ozone in the stratosphere. 2

OR

Why are sacred groves highly protected?

Ans. OR

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

[CBSE Marking Scheme, 2016]

SECTION - C

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? 3

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) Sporopollenin. $\frac{1}{2}$
Most resistant to high temperature / strong acids / alkali / no enzymes can degrade it.

(Any one) $\frac{1}{2}$

- (b) (Germ pores) to allow pollen tube to emerge out / pollen germination. 1
- (c) Helps in storing pollen grains for years / for crop breeding programmes. 1

OR

- (a) Uncontrolled population growth / social evil like sex abuse / sex related crime / STDs.

(Any two) $\frac{1}{2} \times 2$

- (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

[CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) Exine is the hard outer, protective covering of the pollen grain. It is made of sporopollenin. Sporopollenin is one of the most resistant organic compounds, which can withstand high temperature, strong acids and alkalies. It cannot be degraded by any of the known enzymes. Hence, it acts as a shield and protects the pollen grain from getting damaged.
- (b) Exine does not form a continuous layer around the pollen grain. It is absent in certain sections forming germ pores, where sporopollenin is absent. Germ pores, serves as an outlet for the formation of pollen tube.
- (c) Pollen grains can be stored for years in liquid nitrogen at -196°C . After this treatment, they are stored in pollen banks. Such conserved pollen grains can be later used in plant breeding programs.

OR

Amniocentesis is a prenatal diagnostic technique that is used to determine the sex and metabolic disorders of the developing foetus in the mother's uterus through the observation of the chromosomal patterns. This method was developed so as to determine any kind of genetic disorder present in the foetus.

This technique is being misused to detect the sex of the child before birth, and the female foetus is then aborted. Thus, to prevent the increasing female foeticide, there is a statutory ban on it.

12. What is a test cross? How can it decipher the heterozygosity of a plant? 3

Ans. Test cross: 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

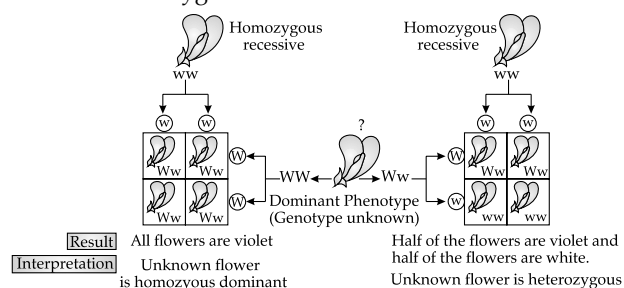
OR

The above value points can be considered with the help of a test cross.

[CBSE Marking Scheme, 2016]

Detailed Answer :

Test cross is a cross between an organism with unknown genotype and a recessive parent. It is used to determine whether the individual is homozygous or heterozygous for a trait.



If the progenies produced by a test cross show 50% dominant trait and 50% recessive trait, then the unknown individual is heterozygous for the trait. On the other hand, if the progeny produced shows dominant trait, then the unknown individual is homozygous for a trait.

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. 3

Ans. (a) Y = Yeast $\frac{1}{2}$
B = Bacterial $\frac{1}{2}$
Used as vector for cloning foreign DNA $\frac{1}{2}$

(b) (<) 2%, (<) 50%. $\frac{1}{2} + \frac{1}{2}$

(c) Single Nucleotide Polymorphism $\frac{1}{2}$ [CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) YAC (Yeast Artificial Chromosomes) and BAC (Bacterial Artificial Chromosomes) are cloning vectors. They are used in human genome project for cloning or amplification of human DNA fragments.

(b) Total number of genes (coding for protein) in the human genome is 30,000 which is less than 2% of the total genome and almost 50% of the discovered genes have unknown functions.

(c) SNPs stand for Single Nucleotide Polymorphism

14. Differentiate between homology and analogy. Give one example of each. 3

| Ans. | S.No | Homology | Analogy |
|------|------|--|--|
| | 1 | Organisms having the same structure developed along different directions due to adaptations / different functions. | Different structures having the same function (in different organisms). |
| | 2. | Result of divergent evolution. | Result of convergent evolution. |
| | 3. | Indicates common ancestry. | Does not indicate common ancestry. |
| | 4. | Anatomically same structures. | Anatomically different structures. (Any two) 1+1=2 |
| | | Example: Forelimbs of whale-bats- cheetah-human// Thorns of Bougainvillea - tendrils of cucurbits | Example: Wings of butterfly and birds // Sweet potato and potato |

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

[CBSE Marking Scheme, 2016]

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. 3

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

(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. $\frac{1}{2} \times 2$

[CBSE Marking Scheme, 2016]

* 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. 3

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. 3

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) $\frac{1}{2} + \frac{1}{2}$

| (b) | Conventional Pest Control | Organic farming based pest control |
|-----|--|--------------------------------------|
| 1. | Use of chemical insecticides & pesticides. | No chemical used. |
| 2. | Harmful to non target organisms. | Not harmful to non target organisms. |
| 3. | Cause environmental pollution. | No adverse impact on environment. |

(Any two) $\frac{1}{2} \times 2$

[CBSE Marking Scheme, 2016]

Detailed Answer:

(a) Organic farmers control pests by utilising natural predation instead of chemicals. Microbial biocontrol agents are the species – specific pesticides.

The examples include :

(i) *Bacillus thuringiensis* : This is a bacterium which produces a toxin that specifically kills insect larvae such as lepidopterans, coleoptera and dipterans leaving aside all other non-targeted organisms.

(ii) *Trichoderma sp.* which is free living fungus and works as a bio-control agent against several plants pathogens.

(b) As compared to conventional pest control methods, organic farmers do not try to completely get rid of pests but keep them at manageable levels. They believe that complete eradication of pests is not beneficial and has certain adverse effects. It leads to death of those beneficial creatures that are dependent on them for food.

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? 3

Ans. (a) amp^R / ampicillin resistance genes, tet^R / tetracycline resistance gene. $\frac{1}{2} \times 2$
 They help in identifying and eliminating non-transformants / non recombinants and selectively permitting the growth of the transformants / recombinants. $\frac{1}{2} \times 2$
 (b) Simpler process / less cumbersome, in the presence of chromogenic substrate recombinants are colourless and non-recombinants are blue in colour. $\frac{1}{2} \times 2$
 [CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) The selectable markers in the cloning vector pBR322 are; Ampicillin resistance gene (amp^R) and tet^R / tetracycline resistance gene (tet^R) They help in identifying and eliminating non-transformed cells and distinguish recombinant cells from non-recombinant cells. The recombinants grow in ampicillin medium but not on tetracycline medium and non-recombinants will grow on the medium containing both the antibiotics.
 (b) The coding sequence of an enzyme β -galactosidase, a preferred selectable marker because it is simpler than others. In the presence of chromogenic substrate, recombinants are colourless and non-recombinants are blue in colour.
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. 3

Ans. (a) (i) To take up the (hydrophilic) DNA from the external medium. 1
 (ii) 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 micro particles (gold or tungsten coated with DNA). 1
 [CBSE Marking Scheme, 2016]

20. Explain enzyme-replacement therapy to treat adenosine deaminase deficiency. Mention two disadvantages of this procedure. 3

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
 [CBSE Marking Scheme, 2016]

Detailed Answer :

Adenosine deaminase deficiency is a genetic disorder. The disorder is caused due to the deletion of the gene for adenosine deaminase, the enzyme crucial for the immune system to function.

Adenosine deaminase deficiency in patients can be treated by enzyme replacement therapy. In this treatment, patients are regularly injected with the functional ADA enzyme.

Disadvantages of this process :

- (a) It does not completely eradicate the disease.
 (b) The requirement of repeated doses of the enzymes makes it expensive.

21. Name and explain the type of interaction that exists in Mycorrhiza and * between cattle egret and cattle. 3

Ans. Mutualism. $\frac{1}{2}$
 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). $\frac{1}{2} \times 2$
 [CBSE Marking Scheme, 2016]

Detailed Answer:

Mycorrhiza is an association between fungi and the roots of higher plants. They show mutualism in which both fungi and plants are dependent on each other for nutritional needs. The fungi help the plant in the absorption of essential nutrients from the soil while the plant provides the fungi with carbohydrates.

- * 22. Differentiate between primary and secondary succession. Provide one example of each. 3

SECTION - D

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. 4

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

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

- 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) $\frac{1}{2} \times 2$

- (b) Physical (abnormality in reproductive system), congenital, immunological or psychological. **(Any two)** $\frac{1}{2} \times 2$
- (c) Intra cytoplasmic sperm injection (ICSI)/ artificial insemination (AI) / Intra uterine insemination (IUI). **1**

[CBSE Marking Scheme, 2016]

SECTION - E

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 there after.
- (d) Draw a graafian follicle and label antrum and secondary oocyte. **5**

OR

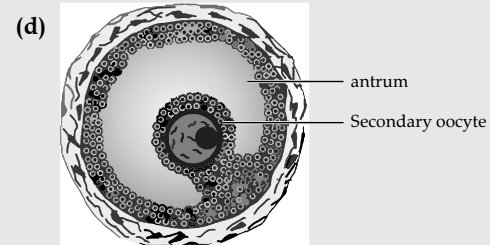
- (a) As a senior biology student you have been asked to demonstrate to the students of secondary level in your school, the procedure(s) that shall ensure cross-pollination in a hermaphrodite flower. List the different steps that you would suggest and provide reasons for each one of them.
- (b) Draw a diagram of a section of a megasporangium of an angiosperm and label funiculus, micropyle, embryo sac and nucleus. **5**

Ans. (a) Menstrual phase occurs when released ovum not fertilized, 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. $\frac{1}{2} \times 3$

Level of ovarian and pituitary hormones fall graphically represented. $\frac{1}{2}$

(b) Primary follicle grows into graafian follicle under the influence of LH & FSH, regeneration of endometrium (under the influence of estrogen). $\frac{1}{2} \times 2$

(c) Graafian follicle ruptures to release the ovum (secondary oocyte), remaining parts of the Graafian follicle transform into corpus luteum. $\frac{1}{2} \times 2$



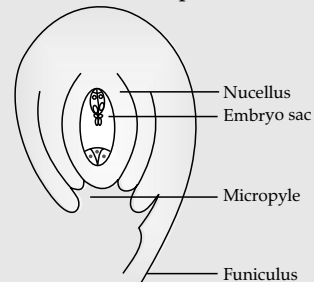
1

OR

- (a) Emasculation, removal of anthers from the flower bud before the anther dehisce to avoid self pollination. $\frac{1}{2} + \frac{1}{2}$
- Bagging, to prevent contamination of its stigma with unwanted pollen grains.

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

Re bagging, the stigma of the mature ovary are dusted with desired pollen grains and rebagged to allow the fruit to develop. $\frac{1}{2} + \frac{1}{2}$



2

[CBSE Marking Scheme, 2016]

Detailed Answer:

(a) Menstrual cycle is the reproductive cycle in all primates. It begins at puberty. The first menstruation that begins at puberty is called Menarche.

The cycle of events, starting from one menstruation till the next one is called menstrual cycle. In human females, menstruation occurs once in 28 to 29 days.

These changes are brought about by ovarian and pituitary hormones. Menstrual phase refers to the beginning of menstruation wherein the endometrium along with its blood vessels supply is shed (menses). During this phase, the levels of both the ovarian and the pituitary hormones are low. The level of follicle stimulating hormone starts to increase during the later stages of this phase.

(b) The menstrual phase is followed by the follicular phase wherein the primary follicles mature into the Graafian follicle under the influence of

FSH and LH. The developing follicles release oestrogen which causes the regeneration of the endometrium. Since, the follicles and the endometrium proliferate during the follicular phase; it is also known as proliferative phase.

- (c) At the time of ovulation, the release of gonadotrophins (LH and FSH) increases. The LH and FSH are at their peak in the middle of the cycle (14th day). The increased level of LH causes the rupturing of Graafian follicle and release of ovum into the fallopian tube. The release of ovum from ruptured Graafian follicle is known as ovulation. The remains of the Graafian follicle get converted into the corpus luteum, which secretes progesterone for the maintenance.

OR

- (a) Cross pollination of a hermaphrodite flower can be achieved by:

(i) **Emasculation:** It is the process of removal of anthers (using forceps) from the bisexual flower bud without affecting the female reproductive part, i.e., pistil.

(ii) **Bagging:** The emasculated flower is then covered with a suitable bag so as to prevent contamination of the stigma with unwanted pollen grains. When the stigma of the bagged flower becomes receptive, the pollen grains collected from the other flower are dusted onto the stigma and then the flower is re-bagged and allowed to develop the fruits.

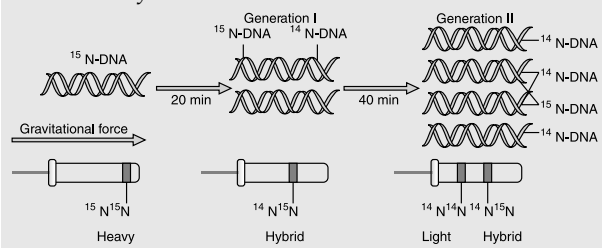
25. Describe Meselson and Stahl's experiment that was carried in 1958 on *E.coli*. Write the conclusion they arrived at after the experiment. 5

OR

- (a) Describe the process of transcription in bacteria.

- (b) Explain the processing the hnRNA needs to undergo before becoming functional mRNA in eukaryotes. 5

Ans. They grew *E.coli* in $^{15}\text{NH}_4\text{Cl}$ for many generations to get ^{15}N incorporated into DNA, then the cells are transferred into $^{14}\text{NH}_4\text{Cl}$, the extracted DNA are centrifuged in CsCl and measured to get their densities, DNA extracted from the culture after one generation (20 minutes), showed inter-mediate hybrid density, DNA extracted after two generations (40 minutes) showed light DNA, and hybrid DNA.



A correctly labelled diagrammatic representation in lieu of the explanation of experiment $\frac{1}{2} \times 8$

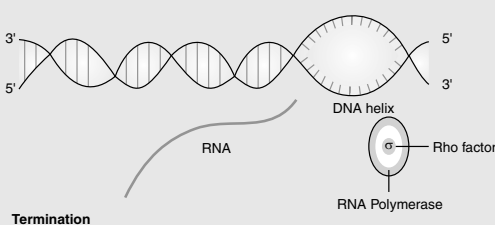
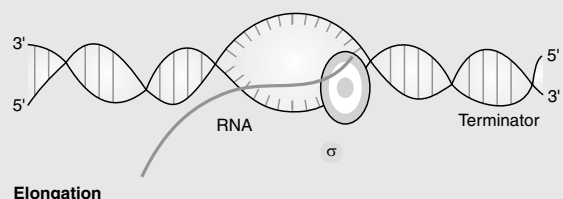
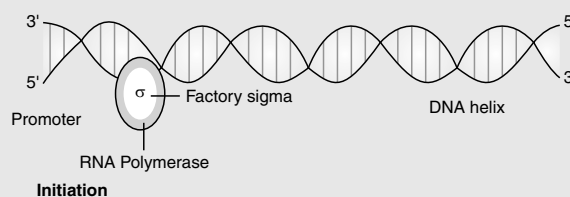
DNA replication is semi-conservative in nature. 1
[CBSE Marking Scheme, 2016]

OR

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

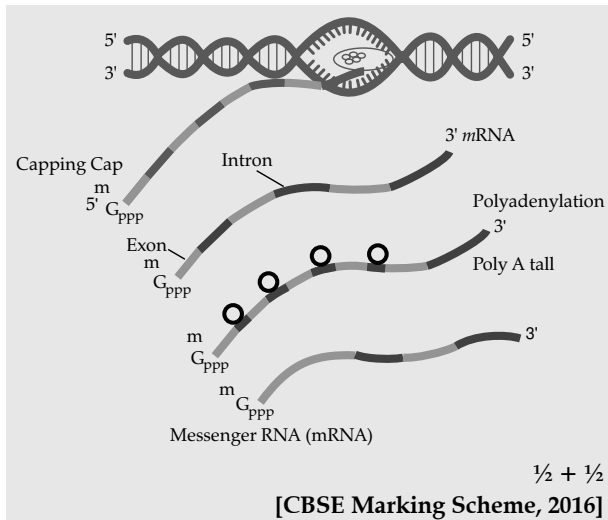
- (ii) **Elongation:** When RNA polymerase moves from promoter to the terminator site it causes the polymerisation of nucleoside triphosphates / Nucleotides resulting in the formation of RNA (in the 5'-3' direction) 1

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



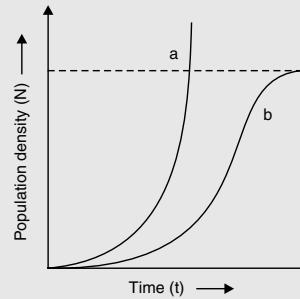
- (b) hnRNA undergoes splicing where introns are removed and exons are joined in defined order. 1

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.)



26. (a) Name the two growth models that represent population growth and draw the respective growth curves they represent. 5
- (b) State the basis for the difference in the shape of these curves. 5
- (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. 5
- OR
- (a) Taking an example of a small pond, explain how the four components of an ecosystem function as a unit. 5
- (b) Name the type of food chain that exists in a pond. 5

Ans. (a) exponential growth curve, logistic growth curve ½ + ½



- a - exponential growth curve, b - logistic growth curve 1
- (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

OR

- 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 environment. 1
- Nutrient cycle:** Mineralization of dead matter to release them back for reuse of autotrophs. 1
- (b) Grazing food chain / detritus food chain. 1

[CBSE Marking Scheme, 2016]

Outside Delhi Set II

Code No. 57/2

Note : Except these, all other Questions are from Set I

SECTION - A

4. Mention two objectives of setting up GEAC by our Government. 1

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

[CBSE Marking Scheme, 2016]

SECTION - B

6. What is aminoacylation? State its significance. 2

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

Carries amino acid to the site of protein synthesis / reaches amino acids to the respective codon. 1+1
[CBSE Marking Scheme, 2016]

Detailed Answer :

The process of adding an activated amino acid to the acceptor arm of a transfer RNA is called aminocylation.

Aminocylation is an important step for the synthesis of protein because it activates the amino acids (amino acid + ATP) and helps in linking them to their cognate tRNA in the presence of an enzyme aminoacyl tRNA synthetase.

8. Gynoecium of a flower may be apocarpous or syncarpous. Explain with the help of an example each. 2

Ans. Carpels are free (apocarpous), e.g. : Michelia. $\frac{1}{2} \times 2$
 Carpels are fused (syncarpous), e.g.: Papaver.
(Any other suitable correct e.g.) $\frac{1}{2} \times 2$
[CBSE Marking Scheme, 2016]

Detailed Answer :

Gynoecium represents the female reproductive part of the flower. If a gynoecium has multiple, free (unfused) carpels, it is called apocarpous gynoecium. e.g; rose. If a gynoecium has multiple carpels fused into a single structure, it is syncarpous gynoecium.e.g; tomato.

- * 9. "Large scale cultivation of *Spirulina* is highly advantageous for human population." Explain giving two reasons. 2

SECTION - C

12. Differentiate between divergent and convergent evolution. Give one example of each. 3

Ans. Difference between divergent and convergent evolution

| Example : | Example : |
|--|--|
| <ul style="list-style-type: none"> ➤ Vertebrates heart & brain ➤ thorn of Bougainvillea and tendrils of cucurbita ➤ fore limbs of whales, bat, cheetah, humans. | <ul style="list-style-type: none"> ➤ Wing of bird & insects ➤ Potato & sweet potato ➤ Eye of Octopus & mammals ➤ Flippers of Penguins & dolphin. |

(Any one example)

(Any one example)

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

(Any two) 1×2

[CBSE Marking Scheme, 2016]

13. (a) List any four characteristics of an ideal contraceptive. 3
 (b) Name two intrauterine contraceptive devices that affect the motility of sperms. 3

OR

- (a) How does a farmer use the dormancy of seeds to his advantage? 3
 (b) What advantages a seed provides to a plant? 3

Ans. (a) User friendly, no side effect, reversible, effective, should not interfere with sexual drive / desire of the user, easily available.

(Any four) $\frac{1}{2} \times 4$

- (b) copper T / copper 7 / Multiload 375.

(Any two) $\frac{1}{2} \times 2$

[CBSE Marking Scheme, 2016]

Detailed Answer:

- (b) Copper-T, and Multi load 375 are copper releasing IUDs that suppress motility and fertilizing capacity of sperms.

OR

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

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

- (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.

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

[CBSE Marking Scheme, 2016]

Detailed Answer:

- (a) Dormancy of mature seeds is crucial for storage of seeds. It can be used by farmers as food throughout the year and also to raise crop in the next season.

(b) Advantages of seed to a plant:

- (a) Seed formation is more dependable.
 (b) Seeds have better adaptive strategies for dispersal to new habitats and help the species to colonise in other areas.
 (c) Seeds have sufficient food reserves and hence can nourish the young seedlings until they are capable of photosynthesis.
 (d) The hard seed coat provides protection to the young embryo.
 (e) The seeds generate new genetic combinations leading to variations.
 (f) Dehydration and dormancy of mature seeds are crucial for storage of seeds which can be used as food throughout the year and also to raise crop in the next season.

17. Predation is usually referred to as a detrimental association. State any three positive roles that a predator plays in an ecosystem. 3

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

$1 + 1 + 1$

[CBSE Marking Scheme, 2016]

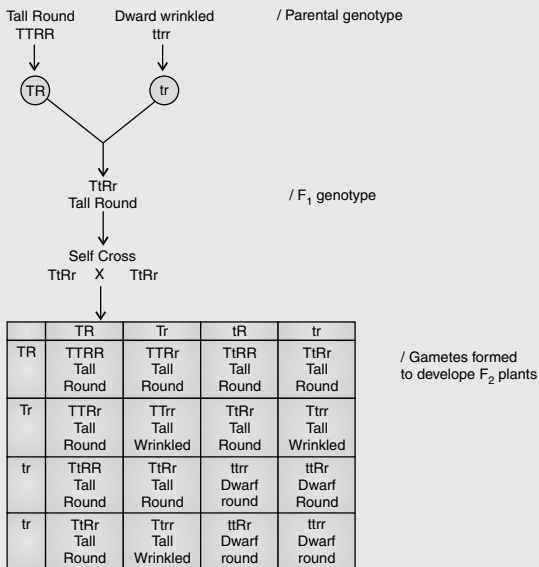
SECTION - E

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 -populations were tall with round seeds. However selfing among F_1 -population led to a 9 : 3 : 3 : 1 phenotypic ratio. 5

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. 5

Ans.



Phenotypic ratio — 1
 Tall Tall Dwarf Dwarf / F₂ Phenotype ½
 Round Wrinkled Round Wrinkled
 9 : 3 : 3 : 1

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 separate 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 F₂ 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

OR

S - strain (heat killed) injected into mice → mice alive ½

R - strain (alive) + S (heat killed) strain inject into mice → 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 protein digesting enzyme(protease) RNA digesting enzyme (RNase) did not affect transformation, Digestion with DNase inhibited transformation, concluded DNA is the heredity material.

[CBSE Marking Scheme, 2016] ½ × 4

Outside Delhi Set III

Code No. 57/3

Note : Except these, all other Questions are from Set I & II

SECTION - A

2. What are transgenic animals. Give an example. 1

Ans. Animals whose DNA is manipulated to possess and express an extra (foreign) gene. eg. Rosie - transgenic cow.

(Any other correct example of animal)
 [CBSE Marking Scheme, 2016] ½ × 2

SECTION - B

6. Name a free-living and a symbiotic bacterium that serve as bio-fertilizer. Why are they so called? 2

Ans. Azospirillum / Azotobacter, Rhizobium.
 (Any other correct example) ½ + ½
 They enrich soil nutrient / nitrogen fixation.
 [CBSE Marking Scheme, 2016] 1½ × 2

7. Name the cells HIV (Human Immunodeficiency Virus) gains entry into after infecting the human body. Explain the events that occur in these cells. 2

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
 [CBSE Marking Scheme, 2016]

10. Out of many papaya plants growing in your garden, only a few bear fruits. Give reason. 2

Ans. Unisexual / Dioecious // male and female flowers are borne on separate plants, only plants bearing female flowers will bear fruits.
 1 + 1 = 2 [CBSE Marking Scheme, 2016]

SECTION - C

13. How do homologous organs represent divergent evolution? Explain with the help of a suitable example. 3

Ans. Organs with similar structure / same ancestry / anatomically same / same origin developed along different directions due to adaptation / 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 structure (i.e. humerus, radius, ulna, carpals, metacarpals and phalanges) develop differently to meet different needs / to perform different functions.

(Any other correct example) 3
[CBSE Marking Scheme, 2016]

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(Any other correct example) 3
[CBSE Marking Scheme, 2016]

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. 3

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? 3

Ans. Progesterone-estrogen / Progesterone-estrogen combination, Progesterone/Progesterone. $\frac{1}{2} + \frac{1}{2}$
They inhibit ovulation, inhibit implantation, alter quality of cervical mucus to retard entry of sperm. $\frac{1}{2} \times 3$
Saheli. $\frac{1}{2}$

OR

Ans. (a) Ovary develops into fruit without fertilization. 1
Formation of seeds without fertilization / form without reductional division / develop into embryo without fertilization. 1
(b) To maintain hybrid characters (year after year in a desired plant), to avoid buying hybrid seeds every year (expensive seeds). $\frac{1}{2} + \frac{1}{2}$

[CBSE Marking Scheme, 2016]

Detailed Answer :

- (a) In some species such as banana, the fruits develop without fertilisation, these fruits are called parthenocarpic fruits.

In some species, the diploid egg cell is formed without reduction division and develops into the embryo without fertilisation, the seeds produced are called apomictic seeds.

- (b) Hybrid varieties of several food and vegetable crops are being extensively cultivated to increase their productivity.

- If these hybrids are made into apomicts, there is no segregation of characters in the hybrid progeny and the cost is reduced.
- The farmers can use the hybrid seeds to raise new crop year after year and are not required to buy hybrid seeds every year

22. Explain Parasitism and co-evolution with the help of one example of each. 3

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

e.g Human liver fluke / Malarial parasite / Cuscuta. $\frac{1}{2}$

Coevolution 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.

(or Any other suitable example) $\frac{1}{2}$

[CBSE Marking Scheme, 2016]

Detailed Answer:

Parasitism is an interaction between two species in which one species (parasite) derives benefit while the other species (host) is harmed. For example, ticks and lice (parasites) present on the human body represent this interaction where in the parasites receive benefit (as they derive nourishment by feeding on the blood of humans). On the other hand, these parasites reduce host fitness and cause harm to the human body.

Co-evolution is an interaction between two living organism where both are equally benefitted and no one is harmed. For example, wasp pollinating fig inflorescence. The fig species is pollinated only by its 'partner' wasp species and no other species. The female wasp pollinates the fig inflorescence while searching for suitable egg-laying sites in fruits, whereas the fig offers the wasp some developing seeds, as food for the wasp larvae.

SECTION - E

24. (a) What is polygenic inheritance? Explain with the help of suitable example.
- (b) How are pleiotropy and Mendelian pattern of inheritance different from polygenic pattern of inheritance? 5

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? 5

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 alleles, more the number of dominant alleles the expression of the trait will be more distinct/ prominent, more the number of recessive alleles the trait will be diluted, if member of dominant and recessive alleles are equal the effect is intermediate. $\frac{1}{2} \times 6$

OR

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

[CBSE Marking Scheme, 2016]

Detailed Answer:

(a) **Polygenic inheritance** is the inheritance of traits that are produced by the combined effect of many genes. Polygenic trait is controlled by more than one pair of non-allelic genes and shows different types of phenotypes. For example, human skin colour is an example of polygenic inheritance. It is caused by a pigment called melanin due to three pairs of polygenes (A, B and C).

(b) **Mendelian inheritance** refers to the expression of monogenic traits, i.e. gene expression is controlled by one gene. In a pair of alleles, an expression of the recessive gene is always masked by the expression of a dominant gene.

Pleiotropy is the ability of a gene to have multiple phenotypic effects because it influences several characters simultaneously.

Polygenic inheritance, on the other hand is a type of inheritance controlled by one or more genes in which the dominant alleles have a cumulative effect with each dominant allele expressing a part or unit of the trait, the full being shown only when all the dominant alleles are present.

OR

Ans. (a) S phase / synthetic phase (of interphase) $\frac{1}{2}$

- (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 e.g., 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.

$\frac{1}{2} \times 7$

- (c) During DNA replication in the two newly synthesised daughter DNA one stand in parental (conserved) and the other is newly synthesised. 1

[CBSE Marking Scheme, 2016]

Detailed Answer :

(a) S-phase (synthesis phase) is the part of the cell cycle in which DNA replication takes place.

(b) Process of DNA replication:

(i) The process of DNA replication begins at a point called the origin of replication (ori), to form a replication fork.

(ii) The separated strands act as templates for the synthesis of new strands.

(iii) DNA replicates in the 5' → 3' direction.

(iv) dNTPs act as substrate and also provide energy for polymerization.

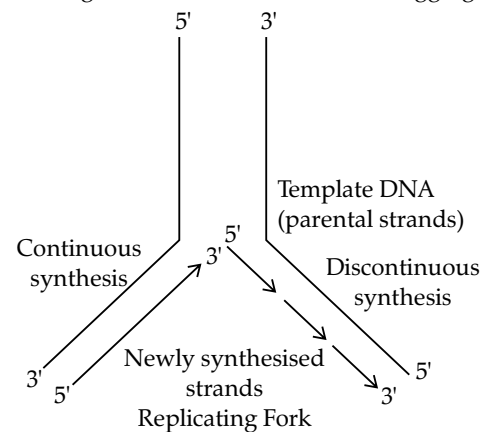
(v) DNA polymerase is an enzyme that assembles a new DNA strand that is complementary to the template strand.

(vi) DNA polymerase continues to move along the template strand and add new nucleotides to the growing or complementary strand until the entire genome is replicated. (vii) The DNA polymerase forms one new strand (leading strand) in a continuous stretch in the 5' → 3' direction (Continuous synthesis).

(viii) The other new strand is formed in small stretches (Okazaki fragments) in 5' → 3' direction (Discontinuous synthesis).

(ix) The Okazaki fragments are then joined together to form a new strand by a enzyme,

DNA ligase. This new strand is called lagging strand.



- (c) DNA replication is said to be semi-conservative. Semi-conservative replication means that double stranded DNA molecule would produce two copies that each contained one