Biology Question Paper for Class 12 CBSE 2016

(Solved)

Section-A

(1 mark each)

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

A.1. The male honey bee develops from an unfertilized egg, whereas a female honey bee develops from a fertilized egg. That is why a male honeybee has 16 chromosomes and the female honeybee has 32 chromosomes.

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

A.2. A genetic mother produces many eggs. It produces about 6-8 eggs under the influence of Follicle Stimulating Hormone.

Q.3. What is biopiracy?

A.3. Several multinational companies and other organizations use the bioresources without proper authorization or compensation to the country or organization concerned. This is known as biopiracy.

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

A.4. CNG is preferred over diesel for the following reasons:

- CNG is cost-effective, cheaper than diesel.
- It causes less pollution.

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

A.5. Homo habilis did not eat meat, whereas, evidence suggested Homo erectus ate eat meat.

Section-B

(2 marks each)

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

A.6. The flowers of the pea plant are bisexual and self-pollinating/monoecious. On the contrary, the papaya plant is dioecious, bearing male and female flowers on the separate plant. Since there is no cross-pollination, they are unable to produce viable seeds.

Q.7. Following are the features of genetic codes. What does each one indicate? Stop codon, unambiguous codon, degenerate codon, universal codon.

A.7.

1. **Stop codon**- terminates the synthesis of amino acid
2. **Unambiguous codon**- One codon codes for only one amino acid
3. **Degenerate codon**- More than one codon codes some amino acids
4. **Universal codon**- genetic code is the same for all organisms, from bacteria to humans

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

A.8. Steps for producing disease resistant plant:

- Screening of germplasm.
- Hybridize the selected parents
- Selection and evaluation of hybrids
- Test and release new varieties.

Q.9. Name a genus of Baculovirus. Why are they considered good biochemical agents?

A.9. Nucleopolyhedrovirus is the genus of baculovirus. They are considered good agents because

- They are species-specific
- They have narrow spectrum insecticidal application
- They have no negative impact on non-target organisms.

Q.10. Explain the relationship between CFCs and ozone in the stratosphere.

OR

Why are sacred groves highly protected?

A.10. The UV rays act on the CFCs and release the Cl atom. The Cl atom acts on ozone to release O_2 . This results in ozone layer depletion.

OR

Ans. The sacred groves are highly protected regions. They are refuges for a large number of rare and threatened species. They are associated with religious and cultural traditions. They are highly rich in biodiversity. That is why they are protected.

Section-C **(3 marks each)**

Q.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?

OR

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

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

A.11.

(a) The exine of the pollen grain is made up of sporopollenin. This material is highly resistant to high temperature, acids, alkalies, and enzymes.

(b) The exine is absent in certain sections called germ pores and hence does not form a continuous layer around the pollen grain. The germ pores serve as an outlet for the formation of the pollen tube.

(c) Pollen grains are stored for years by cryopreservation and then stored in the pollen banks. These conserved pollen grains are later used in plant breeding.

OR

Ans.

(a) The Reproduction and Child Health Care Programme takes care of the following problems:

- Uncontrolled population growth
- Sex-related crimes
- Sexual abuse
- Sexually Transmitted Diseases

(b) Amniocentesis is a technique to determine the foetal sex based on the chromosomal pattern in the amniotic fluid. It is also used to identify chromosomal abnormalities in the foetus.
It was banned to reduce female foeticide

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

A.12. A test cross is used to identify whether the genotype of the dominant individual is heterozygous or homozygous.
In a test cross, the progeny is crossed with a recessive parent. If the progeny is 50% dominant and 50% recessive, it is a heterozygous plant.

Q.13.
(a) What do 'Y' and 'B' stand for in 'YAC' and 'BAC' used in Human Genome Project? 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.

A.13.

(a) 'Y' stands for Yeast and 'B' stands for Bacteria.
They are used as vectors in DNA cloning.

(b) The percentage of the total human genome that codes for proteins is <2%, whereas, that of discovered genes with known functions is <50%.

(c) SNP stands for Single Nucleotide Polymorphism.

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

A.14.

Difference Between Homology And Analogy	
Homology	**Analogy**
Different organisms having the same structures but different functions exhibit Homology.	Different organisms having different structures with similar functions exhibit Analogy.
Results due to divergent evolution.	Results due to convergent evolution.
Descended from common ancestors.	Descended from different ancestors.
For eg., forelimbs of whales, bats, human. Thorns of bougainvillaea and cucurbits.	For eg., Wings of butterflies and birds. Sweet potato and potato

Q.15.

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

(b) What are interferons? Mention their role.

A.15.

(a) The primary response is induced at the very first infection which generates antibodies against the virus. Due to the memory cells formed during the first encounter, a highly intensified secondary response is induced on the encounter with the same virus in the later years.

(b) Interferons are the proteins that are produced and released by the host cells in response to pathogens such as virus, bacteria, etc.

Role: Interferons stimulate the immune system to fight against diseases and inhibit viral infections. It also plays a role in regulating many kinds of cell functions.

Q.16.

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

(b) Mention two advantages of micropropagation.

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

A.16.

(a) The two limitations of the traditional breeding technique are:

- Failure to keep pace with demand.
- An inefficient and slow system of crop improvement.

(b) Two advantages of micropropagation are:

- Genetically identical plants are produced
- Production of a large number of plants in a short duration

(c) Micropropagation is commercially adopted in the production of tomato, banana, and apple.

Q.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.

A.17.

(a) The organic farmers control pests by natural predation or biological control. Insecticides and pesticides that are species specific and do not harm the non-target species are used. For eg., *Bacillus thuringiensis* produces a toxin during sporulation, Bt toxin. These toxins bind with the receptors of the epithelial cells of gallworm and insert into the plasma membrane. They lyse the cell leading to cell death. This is how they serve as the biopesticide for gallworm.

Trichoderma is a free-living fungus which reduces pathogenic infections by different mechanisms such as hyphal interactions, competition, antibiosis, mycoparasitism, and enzyme secretion.

(b) The total eradication of pests by the organic farmers can harm the organisms that are dependent on them for food. Instead, they try to keep a check on the number of pests to avoid any harm to the crops.

Q.18.

(a)Name the selectable marker in the cloning of 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?**

A.18.

(a) There are two selectable markers in the cloning vector pBR322 - ampicillin and tetracycline. Selectable markers are the antibiotic resistance genes that help to distinguish

the transformed cells from non-transformed cells, and the recombinant cells from the non-recombinant one's.

(b) The β-galactosidase gene exhibits the property of insertional inactivation. The gene is inactivated when a foreign sequence is inserted into it. When the bacteria are grown on a chromogenic substrate, blue colonies are observed for the non-recombinants while colourless colonies for recombinants. That is why it is preferred over selectable markers because the recombinants are easily visualized, thereby making the identification process less difficult.

Q.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 the biolistic gun in biotechnology experiments.

A.19.

(a) The host cells take up foreign DNA. The cells which have the ability to uptake foreign DNA are known as competent cells. The cells are treated with calcium ions. This enables the cells to attract negatively charged DNA and negatively charged groups, allowing the DNA to pass through the cell membrane and enter the cell.

(b) The biolistic gun method is the method of transfer of genes in the plant cells. The cells are shot with microscopic tungsten or gold particles coated with several genes to be transferred into the plant cell.

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

A.20. Enzyme Replacement Therapy is the technique of replacing the defective enzyme by an intravenous infusion containing an enzyme. Polyethylene glycol is conjugated with purified bovine ADA and a modified enzyme is thus prepared. The PEG-ADA conjugate is periodically administered by intramuscular injection.

Two disadvantages of this procedure are:

- The disease is treated only temporarily.
- The process is very expensive due to the periodic administration of the enzyme.

Q.21. Name and explain the type of interactions that exist in mycorrhizae and between cattle egret and cattle.

A.21. Mycorrhiza is the association between fungi and the roots of higher plants. The fungal hyphae decompose the organic matter present in the soil and increase the surface area of the plant roots for better absorption of water and minerals. The plant provides the fungus with organic nutrients. Such an association is known as a mutualistic association.
The egret bird is found in the areas of grazing cattle. When the cattle move on the grass, the insects within the grass come out, and consequently, these insects become a feed to the birds. The bird is being benefitted whereas the cattle is neither harmed nor benefitted. Such an association is known as **commensalism**.

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

A.22.

Difference Between Primary Succession And Secondary Succession	
Primary Succession	**Secondary Succession**
The succession that takes place in the barren areas, which have never been occupied by any life forms is called primary succession.	The succession that occurs in the areas where the existing life forms were destroyed is called secondary succession.
The process is slow because the soil is infertile.	The process is fast because the soil initially was fertile.
For eg., succession in cooled lava.	For eg., succession in a burnt forest.

Section-D

(4 marks each)

Q.23. A large number of 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 the situation in India? Mention any two values that, 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.

A.23.

(a) The female partner is blamed due to lack of awareness about the various reasons for infertility.

The two values that can promote to check this evil are:

- The people should be educated about the causes of infertility in both males and females.
- They should be taught to go for proper diagnosis in both the partners before jumping to any conclusion.

(b) Two reasons responsible for infertility are:

- Abnormality in the reproductive system
- Congenital disease

(c) Artificial insemination is a technique to overcome the problem. If a male has erectile dysfunction or has a low sperm count, fertilization does not occur. Hence, the sperms are injected into the female vagina to overcome this problem.

Section-E

(5 marks each)

Q.24.

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

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

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

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

OR

(a) As a senior biology student, you have been asked to demonstrate to the students of secondary level in your school, the procedure that shall ensure cross-pollination in a

hermaphrodite flower. List the different steps that you would suggest and provide reason for each of them.

(b) Draw a diagram of a section of microsporangium of an angiosperm and label funiculus, micropyle, embryo sac, and nucellus.

A.24.

(a) If the ovum is not fertilized the menstrual phase occurs. The endometrium lining starts shedding and the blood vessels form the liquid that secrete out from the vagina. This phase lasts for 3-5 days.

(b) During the follicular phase, the uterine endometrium starts to thicken due to the secretion of estrogen by the developing follicles. The uterus is being prepared for implantation. Hence, it is known as the proliferative phase.

(c) Between 12 to 14 days, the luteinizing hormone surges, stimulating the rupture of Graafian follicle the release of ovum, i.e., ovulation. After ovulation, the Graafian follicle ruptures forming a clot inside called corpus hemoragicum. It is transformed into corpus luteum which secretes estrogen and progesterone during the initial months of pregnancy.

(d) Diagram

OR

Ans.

(a) A hermaphrodite flower has both the male and female parts, i.e., the pollen as well as the stigma. The steps to ensure cross-pollination are as follows:

- **Emasculation-** It is the process of removal of anther from the flowers. This prevents self-pollination.
- **Bagging-** The stigma is covered with polythene to prevent self-pollination.
- **Pollen dusting from the desired plant-** The pollen from the desired plant are dusted over the stigma which is then rebagged to prevent any contamination.

(b) Diagram

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

OR

(a) Describe the process of transcription in bacteria.

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

A.25. The semi-conservative nature of DNA replication was exhibited by Meselson and Stahl. In this, a DNA strand serves as a template for the synthesis of the new strand. Thus, two new DNA molecules are produced, each with a new strand and a parental strand.

The E.coli cells were cultured in a medium containing ammonium salts prepared with heavy nitrogen (15N) to label all cellular DNA. The cells were transferred to a medium containing normal light isotope (14N). DNA underwent density-gradient centrifugation to separate the heavy-heavy, light-light, and heavy-light bands.

It was observed that since E.coli takes 20 minutes to divide, the DNA extracted after 20 minutes had a hybrid density while that extracted after 40 minutes had a hybrid as well as light density. Each DNA molecule had a parental strand and a new strand.

OR

(a) Transcription is the process of conversion of DNA into mRNA. It occurs in three steps:

- Initiation
- Elongation
- Termination

Initiation

The sigma factor of RNA Polymerase helps to locate the promoter and the polymerase binds there. The double-stranded DNA unwinds then.

Elongation

The sigma factor dissociates from the promoter, the polymerisation of nucleoside triphosphate occurs.

Termination

The Rho protein binds with the RNA at the CA-rich sequence and moves along the DNA strand in the 5'-3' direction. It reaches the transcription complex that is paused at a termination site and the process terminates here. This is known as Rho-dependent transcription termination.

In the Rho-independent transcription termination, the GC-rich sequence forms a hairpin structure. When the transcription complex reaches the hairpin structure, the process terminates.

(b) The hnRNA undergoes three steps before becoming functional mRNA:

- Splicing
- Capping
- Tailing

Splicing

The removal of introns and the ligation of exons to form a continuous sequence of a functional polypeptide.

Capping

7-Methylguanosine is added to the 5' end of all eukaryotic mRNAs in a 5',5'-triphosphate linkage

Tailing

The 3' end is cleaved and 80-250 Adenine residues are added to create a poly(A) tail.

Q.26.

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

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

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

OR

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

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

A.26.

(a) The two types of growth models are:

Exponential Growth Model

The population growth is exponential in the presence of unlimited resources. Let us assume;
N = Population size
b = birth rate
d = death rate
Increase or decrease in N during time is;
dN/dt = (b - d) * N

If, (b - d) = r
Where, r is the intrinsic rate of natural increase

Then, dN/dt = rN

Or $N_t = N^{rt}$

N_0 = Initial population density at time 0
N_t = Population density at time t
r = intrinsic rate of natural increase
e = base of natural log

Logistic Growth Model

When the resources are limited, there is competition among the population for survival. This leads to the logistic population growth. When N is plotted against time t, a sigmoid curve is obtained. It is represented by the equation:

dN/dt = rN (K - N/K)

(b)

Difference between J and S Curves	
J-Shaped Curve	**S-Shaped Curve**
A curve of exponential growth.	A curve of logistics growth.
Represents unlimited population growth.	Represents a decrease in population in population growth.
Observed in the presence of unlimited resources and space.	Observed in the presence of limited resources and space.

(c) The present population represents the logistics growth model of population growth. This is because the limited resources and space are not able to sustain a large population.
This curve is not sustainable because it might lead to the scarcity of resources in the near future. There is a need for alternative resources to fulfil the demands of the increasing population.

OR

(a) The functioning of the ecosystem is studied by considering productivity, decomposition, nutrient cycle and energy flow.

Productivity

In the pond ecosystem, the phytoplanktons act as producers and capture the sunlight to synthesize organic nutrients. The rate at which the energy is converted into organic nutrients is referred to as primary productivity. Thus, phytoplanktons impart primary productivity to the pond ecosystem.

Energy Flow

The pond ecosystem has several consumers; zooplanktons are the primary consumers, nektonic animals are the secondary consumers, and benthic animals are the tertiary consumers. The energy flows from producers to consumers. The primary consumers feed on producers, the secondary consumers feed on the primary consumers, and tertiary consumers feed on secondary consumers.

Decomposition and Nutrient Cycle

The parasites and saprophytes in the pond ecosystem decompose the dead and decaying organic matter. The decomposition releases certain nutrients which are utilized by the producers to synthesize their organic matter.

(b) The food chain in the pond ecosystem is the Grazing Food Chain or the Detritus Food Chain. The plants are the producers. They are consumed by the primary consumers, which are then consumed by the secondary consumers.

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