CBSE Sample Paper -06

Class 12 Biology

(Questions)

General Instructions:

(i) All questions are compulsory.

(ii) This question paper consists of four Sections A, B, C and D. Section A contains 5 questions of one mark each, Section B is of 5 questions of two marks each, Section C is of 12 questions of three marks each and 1 question of four mark and Section D is of 3 questions of five marks each.

(iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.

(iv) Wherever necessary, the diagrams drawn should be neat and properly labelled.

Section A

1. Define the term clone.
2. What are the pre-fertilisation events in plants?
3. Define linkage.
4. Name the first Restriction Endonuclease to be identified?
5. Expand ELISA.

Section B

6. Identify the diagram and label the parts.
7. What are the barriers that comprise Innate Immunity?
8. Complete the following table.

Drug name	Plant
Opiods	
Cannabinoids	
Cocaine	

9. What are the causative organisms of the following diseases
   a) Typhoid
   b) Malaria

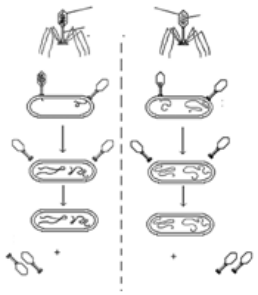
10. Who were the scientists who helped formulate the genetic code

Or

What are the basic processes that lead to fluctuations in density of a given population.

Section C

11. Elaborate the asexual mode of reproduction in the following.
    a) Chlamydomonas
    b) Hydra
    c) yeast
12. What was the result of the experiment of monohybrid cross in Snapdragon.
13. Label the diagram above and make the experiment self explanatory.



14. What is the principle of Genetic equilibrium?
15. What are the symptoms of the disease which is confirmed by a Widal test?
16. What are the proteins produced by B lymphocytes? Give Diagram.
17. What are the requisites of a cloning vector?
18. What are the different methods by which a cell can be made competent?
19. What are bioreactors? Illustrate a simple stirred tank bioreactor.
20. What are GMOs? What are their uses?
21. What is "The Evil Quartet"?
22. What are Ecological Pyramids? What are the 3 types?
23. **Tapas was one of the best boys in the class. In spite of his efforts he was not doing well inclass XI. His father wanted him to qualify for medical sciences. He got frustrated with his results and resorted to drugs. He started misbehaving with parents and friends in school. His friends started neglecting him. The school authorities counseled Tapas but to no effect. His parents were upset and took him to a rehabilitation centre. After a few months, he came back recovered.**

a) What values did the Principal reflect through his initiative?

b) What is drug abuse?

c) Name some commonly abused drugs and their source.

d) What should be the attitude of his parents after his return?

Section D

24. Explain and illustrate the development of the embryo sac

OR

Schematically represent spermatogenesis and oogenesis with ploidy at each stage.

25. (a) Formation of life was preceded by chemical evolution. Which is the experiment which proved this?

(b) What is nucleosome?

OR

a) Represent schematically the independent assortment of chromosomes..

b) What are the requisites for a molecule to be a genetic material?

26. Elaborate on the key abiotic elements that contribute to the variation in habitats.

Or

What are the arguments for conserving biodiversity?

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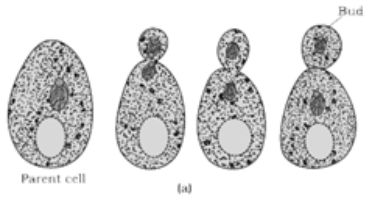
Class 12 Biology

Answers

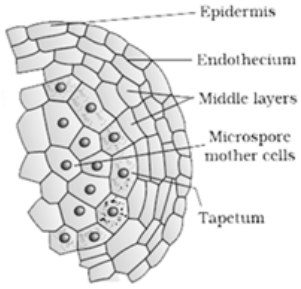
1. In asexual reproduction a single individual (parent) is capable of producing an offspring. As a result, the offspring that are produced are not only identical to one another but are also exact copies of their parent. The term **clone** is used to describe such morphologically and genetically similar individuals.



2. Several hormonal and structural changes are initiated which lead to the differentiation and further development of the floral primordium. Inflorescences are formed which bear the floral buds and then the flowers. In the flower the male and female reproductive structures, the androecium and the gynoecium differentiate and develop.
3. When two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than the non-parental type. This physical association of genes on a chromosome is termed linkage and the term was coined by Morgan.
4. AUG
5. Enzyme linked Immuno Sorbent Assay.

Section B

6. Structure of microsporangium showing wall layers



7. Innate immunity consists of four types of barriers. These are —

(i) Physical barriers

(ii) Physiological barriers.

(iii) Cellular barriers

(iv)Cytokine barriers

8.

Drug name	Plant
Opiods	Poppy Plant *Papaver somniferum*
Cannabinoids	*Cannabis sativa*
Cocaine	Coca plant *Erythroxylum coca*

9. Causative organisms of the following diseases

a) Typhoid - *Salmonella typhi*

b) Malaria- *Plasmodium falciparum*

10. George Gamow, Hargobind Khorana and Marshall Nirenberg.

Or

The basic processes that lead to fluctuations in density of a given population are

(i) Natality

(ii) Mortality

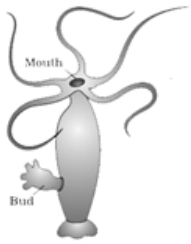
(iii) Immigration

(iv) Emigration

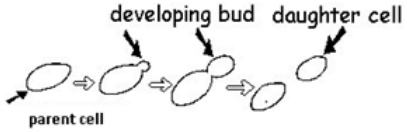
Section C

11. Chlamydomonas is an algae which reproduces by formation of zoospores which are microscopic motile structures.

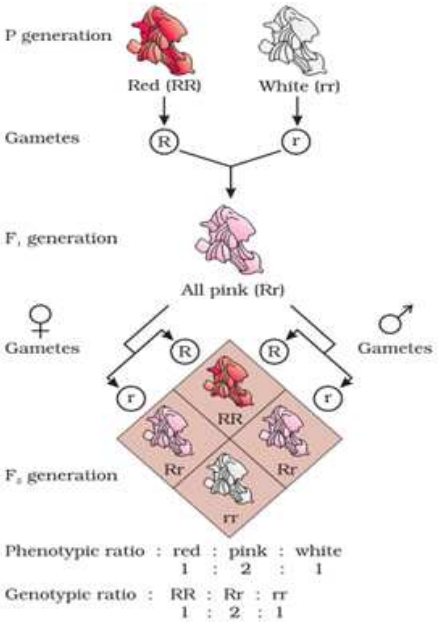
Hydra reproduces by formation of buds which bud from the parent body.



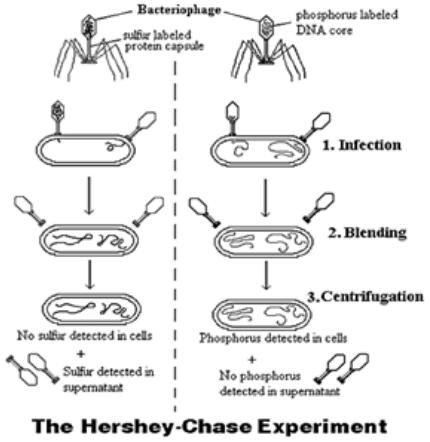
Yeast, the division is unequal and small **buds** are produced that remain attached initially to the parent cell which, eventually gets separated and mature into new yeast organisms.



12. The inheritance of flower colour in the dog flower (snapdragon or *Antirrhinum sp.*) is a good example of incomplete dominance. In a cross between true-breeding red-flowered (RR) and true breeding white-flowered plants (rr), the F1 (Rr) was pink . When the F1 was self-pollinated the F2 resulted in the following ratio 1 (RR) Red: 2 (Rr) Pink: 1 (rr) White. Here the genotype ratios were exactly as in any Mendelian monohybrid cross, but the phenotype ratios had changed from the 3:1 dominant: recessive ratio. R was not completely dominant over r and this made it possible to distinguish Rr as pink from RR (red) and rr (white).



13.



The Hershey-Chase Experiment

This experiment proved that DNA is the genetic material.

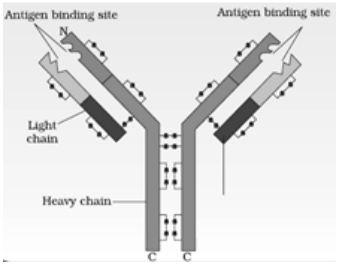
14. Hardy-Weinberg principle says that allele frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains a constant. This is called genetic equilibrium.

    Sum total of all the allelic frequencies is 1. Individual frequencies, for example, can be named p, q, etc. In a diploid, p and q represent the frequency of allele *A* and allele *a*. The frequency of *AA* individuals in a population is simply p2. The probability that an allele A with a frequency of p appear on both the chromosomes of a diploid individual is simply the product of the probabilities, i.e., p2. Similarly of aa is q^2, of Aa 2pq. Hence, $p^2+2pq+q^2=1$. This is a binomial expansion of $(p+q)^2$. When frequency measured, differs from expected values, the difference (direction) indicates the extent of evolutionary change. Disturbance in genetic equilibrium, or Hardy- Weinberg equilibrium, i.e., change of frequency of alleles in a population would then be interpreted as resulting in evolution.

15. *Salmonella typhi* is a pathogenic bacterium which causes **typhoid** fever in human beings. These pathogens generally enter the small intestinethrough food and water contaminated with them and migrate to otherorgans through blood. Sustained high fever (39° to 40°C), weakness,stomach pain, constipation, headache and loss of appetite are some ofthe common symptoms of this disease. Intestinal perforation and deathmay occur in severe cases. Typhoid fever could be confirmed by Widal test.

16. The B-lymphocytes produce proteins in response to pathogens into our blood to fight with them. These proteins are called antibodies. Each antibody molecule has four peptide chains, two small called **light chains** and two longer called **heavy chains**. Hence, an

antibody is represented as H2L2. Different types of antibodies are produced in our body. IgA, IgM, IgE, IgG are some of them.

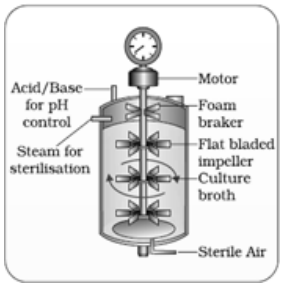


17. Requisites of a cloning vector
    a. **Origin of replication (ori)** : This is a sequence from where replication starts and any piece of DNA when linked to this sequence can be made to replicate within the host cells.
    b. **Selectable marker** : In addition to 'ori', the vector requires a selectable marker, which helps in identifying and eliminating nontransformants and selectively permitting the growth of the transformants.
    c. **Cloning sites:** In order to link the alien DNA, the vector needs to have very few, preferably single,**recognition sites** for the commonly used restriction enzymes. Presence of more than one recognition sites within the vector will generate several fragments, which will complicate the gene cloning.
18. The bacterial cells must first be made 'competent' to take up DNA. This is done by treating them with a specific concentration of a divalent cation, such as calcium, which increases the efficiency with which DNA enters the bacterium through pores in its cell wall. Recombinant DNA can then be forced into such cells by incubating the cells with recombinant DNA on ice, followed by placing them briefly at 420C (heat shock), and then putting them back on ice. This enables the bacteria to take up the recombinant DNA.

    In a method known as **micro-injection**, recombinant DNA is directly injected into the nucleus of an animal cell.

    In another method, suitable for plants, cells are bombarded with high velocity micro-particles of gold or tungsten coated with DNA in a method known as **biolistics** or **gene gun**. Another method uses 'disarmed pathogen' vectors, which when allowed to infect the cell, transfer the recombinant DNA into the host.
19. Bioreactors can be thought of as vessels in which raw materials are biologically converted into specific products, individual enzymes, etc., using microbial plant, animal or human

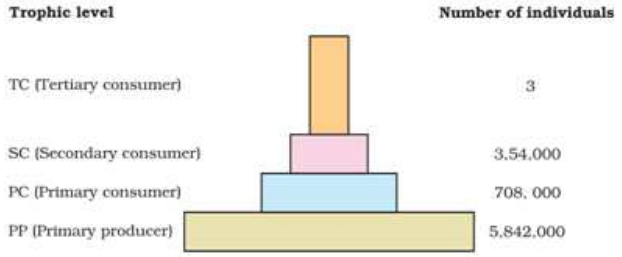
cells. A bioreactor provides the optimal conditions for achieving the desired product by providing optimum growth conditions (temperature, pH, substrate, salts, vitamins, oxygen). The most commonly used are the stirred tank type.

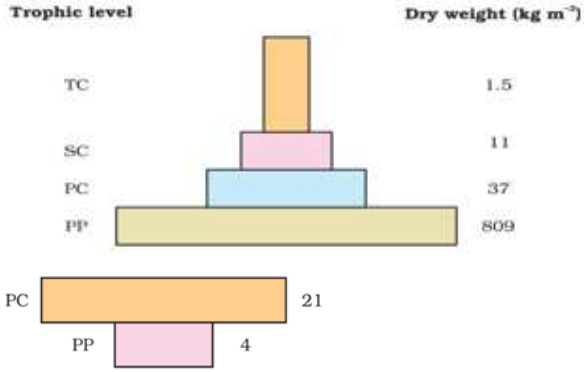


20. Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO). GM plants have been useful in many ways. Genetic modification has:
    (i) made crops more tolerant to abiotic stresses (cold, drought, salt, heat).
    (ii) reduced reliance on chemical pesticides (pest-resistant crops).
    (iii) helped to reduce post harvest losses.
    (iv) increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil).
    (v) enhanced nutritional value of food, e.g., Vitamin 'A' enriched rice.
    (vi) create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals.
21. The accelerated rates of species extinction are due to 4 main causes which is called the evil quartet.
    They are
    a) Habitat loss and fragmentation
    b) Over-exploitation
    c) Alien species invasions
    d) Co-extinctions.
22. The food, number or energy relationships between organisms at each trophic level is explained by Ecological pyramids. The base of each pyramid represents the producers or the first trophic level while the apex represents tertiary or top level consumer. The three ecological pyramids that are usually studied are
    (a) pyramid of number

(b) pyramid of biomass and

(c) pyramid of energy.





23.

a. The Principal showed his social liability and responsibility.

b. Intake of drugs for a non- medical purpose in the dose, strength, frequency and theway of taking which impairs mental and physical functions of human being is drug abuse.

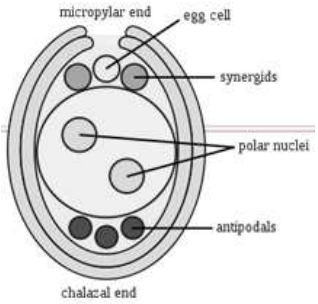
c. **Opium:** from plant *Papaver somniferum*- its derivatives includes **morphine, codeine, heroin, smack** i.e brown sugar etc.

d. **Cocaine:** from Erythroxylon coca, **crack** - a cocaine derivative, **caffeine**from *Thea sinensis, Coffea Arabica, Theobroma cacao.*

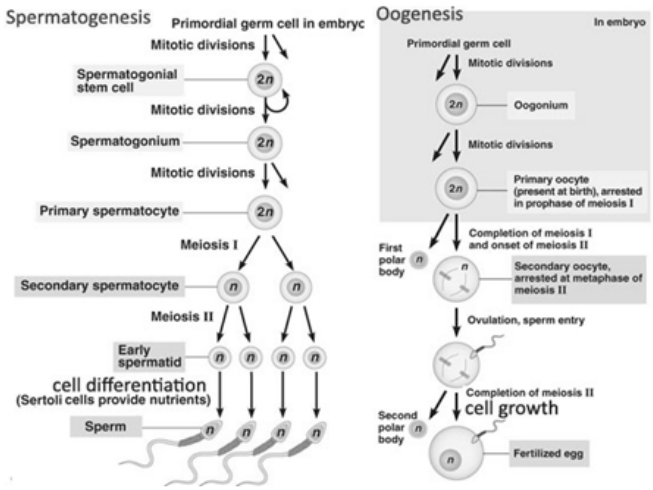
Section D

24. The nucleus of the functional megaspore divides mitotically to form two nuclei which move to the opposite poles, forming the 2-nucleate embryo sac. Two more sequential mitotic nuclear divisions result in the formation of the 4-nucleate and later the 8-nucleate stages of the embryo sac. Nuclear divisions are not followed immediately by cell wall formation. After the 8-nucleate stage, cell walls are laid down leading to the organisation of the typical female gametophyte or embryo sac. Six of the eight nuclei are surrounded by cell walls and organised into cells; the remaining two nuclei, called polar nuclei are

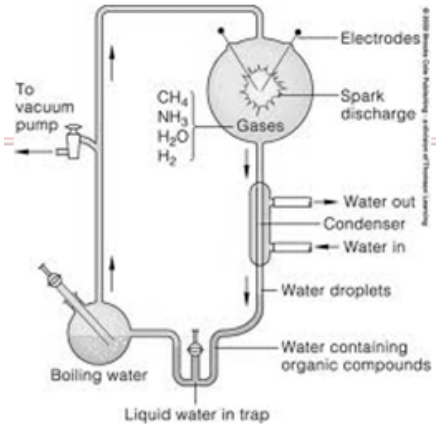
situated below the egg apparatus in the large central cell. There is a characteristic distribution of the cells within the embryo sac. Three cells are grouped together at the micropylar end and constitute the egg apparatus. The egg apparatus, in turn, consists of two synergids and one egg cell. The synergids have special cellular thickenings at the micropylar tip called filiform apparatus, which play an important role in guiding the pollen tubes into the synergid. Three cells are at the chalazal end and are called the antipodals. The large central cell has two polar nuclei. Thus, a typical angiosperm embryo sac, at maturity is 8-nucleate and 7-celled.



Or

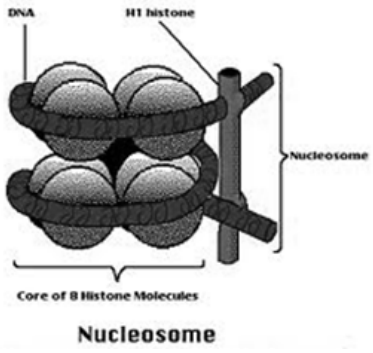


25. a)The first form of life could have come from pre-existing non-living organic molecules (e.g. RNA, protein, etc.) and that formation of life was preceded by chemical evolution, i.e., formation of diverse organic molecules from inorganic constituents. The conditions on earth were – high temperature, volcanic storms, reducing atmosphere containing CH4, NH3, etc.



Miller and Urey created similar conditions in a laboratory scale. He created electric discharge in a closed flask containing CH4, H2, NH3 and water vapour at 8000C. He observed formation of amino acids. In similar experiments others observed, formation of sugars, nitrogen bases, pigment and fats. Analysis of meteorite content also revealed similar compounds indicating that similar processes are occurring elsewhere in space.

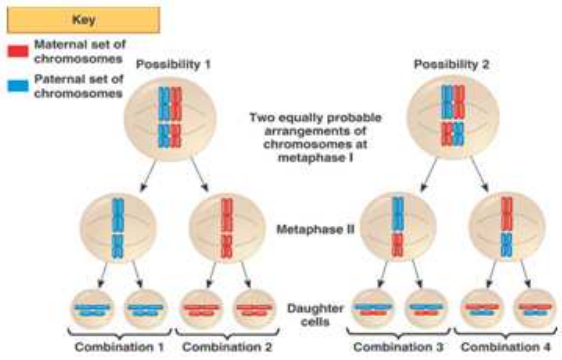
b) In eukaryotes, the organization of DNA is complex. There is a set of positively charged, basic proteins called histones which are rich in the basic amino acid residues lysines and arginines. Both the amino acid residues carry positive charges in their side chains. Histones are organised to form a unit of eight molecules called as histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome. A typical nucleosome contains 200 bp of DNA helix. Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin, thread-like stained (coloured) bodies seen in nucleus. The nucleosomes in chromatin are seen as 'beads-on-string' structure when viewed under electron microscope



Nucleosome

OR

a)



b) A molecule that can act as a genetic material must fulfill the following criteria:

(i) It should be able to generate its replica (Replication).

(ii) It should chemically and structurally be stable.

(iii) It should provide the scope for slow changes (mutation) that are required for evolution.

(iv) It should be able to express itself in the form of 'Mendelian Characters'.

c) The important ones are

Abiotic components- temperature, water, light and soil.

Biotic components – pathogens, parasites, predators and competitors.

Temperature- It affects the kinetics of enzymes and through it the basal metabolism, activity and other physiological functions of the organism. A few organisms can tolerate and thrive in a wide range of temperatures (eurythermal), but, a vast majority of them are restricted to a narrow range of temperatures (stenothermal). The levels of thermal tolerance of different species determine to a large extent their geographical distribution.

Water- Life is unsustainable without water. Its availability is so limited in deserts that only special adaptations make it possible to live there. The productivity and distribution of plants is heavily dependent on water. For aquatic organisms the quality (chemical composition, pH and salinity) of water becomes important. Some organisms are tolerant of a wide range of salinities (euryhaline) but others are restricted to a narrow range (stenohaline). Many freshwater animals cannot live for long in sea water and vice versa because of the osmotic problems, they would face.

Light- is required for

a) Photosynthesis

b) Flowering

c) Diurnal and seasonal migrations of organisms.

Or

The **narrowly utilitarian** arguments for conserving biodiversity are obvious; humans derive countless direct economic benefits from nature food (cereals, pulses, fruits), firewood, fibre, construction material, industrial products (tannins, lubricants, dyes, resins, perfumes) and products of medicinal importance.

The **broadly utilitarian** argument says that biodiversity plays a major role in many ecosystem services that nature provides. Pollination (without which plants cannot give us fruits or seeds) is another service, ecosystems provide through pollinators layer – bees, bumblebees, birds and bats.

The **ethical** argument for conserving biodiversity relates to what we owe to millions of plant, animal and microbe species with whom we share this planet.