Sample Question Paper - 21
Biology (044)
Class- XII, Session: 2021-22
TERM II

Time allowed : 2 hours ***Maximum marks : 35***

General Instructions :

(i) All questions are compulsory.

(ii) The question paper has three sections and 13 questions. All questions are compulsory.

(iii) Section–A has 6 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has a case-based question of 5 marks.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION - A

1. A person is suffering from ascariasis. Mention the pathogen causing the disease and an organ of the body affected, three symptoms and one mode of transmission of the disease.

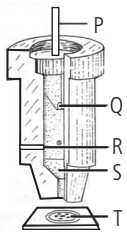
OR

How do interferons produced by cytokine barriers provide innate immunity in humans?

2. **(a)** Name the alcoholic drinks which are produced with and without distillation.

(b) Name the bioactive molecules produced by *Trichoderma polysporum* and *Monascus purpureus*.

3. **(a)** Identify the instrument shown in the given figure and correctly label its parts P, Q, R, S and T.

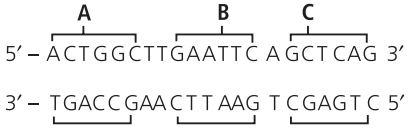


(b) How is it used in gene transfer methods?

(c) State its significance in r-DNA technology.

OR

The given figure shows three different points A, B and C on a DNA strand.



Which of them can be a probable site of action of restriction enzymes and why?

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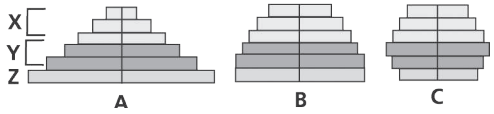
4. The given figure shows the different types of age pyramids for human population.



(a) What do the parts 'X', 'Y' and 'Z' represent?

(b) Which type of population is represented by pyramids A, B and C? Explain.

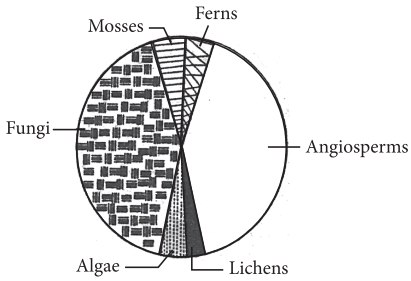
5. Explain the significance of 'palindromic nucleotide sequence' in the formation of recombinant DNA.

6. How has the use of *Agrobacterium* as vectors helped in controlling *Meloidogyne incognita* infestation in tobacco plants?

SECTION - B

7. A person shows strong unusual hypersensitive reactions when exposed to certain substances present in the air. Identify the condition. Name the cells responsible for such reactions. What precaution should be taken to avoid such reactions?

8. Differentiate between on site and off site approaches of conservation of biodiversity.

9. 

Observe the global biodiversity distribution of major plant taxa in the above diagram and answer the questions that follow.

(a) Which group of plant are most endangered?

(b) Why are mosses/ferns so few? Give reason.

(c) How do fungi that are heterotrophs sustain themselves as a large population?

(d) Which group of plant is most advanced and which one is most primitive?

10. **(a)** Name the source from which insulin was extracted earlier. Why is this insulin no more used by diabetic people?

(b) How is the insulin produced by human body different from the insulin produced by an American company, Eli Lilly ?

11. Selectable markers have been developed to differentiate recombinants from non-recombinants on the basis of their ability to produce colour in presence of a chromogenic substrate. Explain the reason for appearance of colourless and blue-coloured colonies.

12. Why are herbivores considered similar to predators in the ecological context? Explain the relationship between the two.

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OR

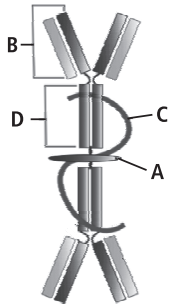
Differentiate between the following interspecific interactions in a population :

(i) Mutualism and parasitism

(ii) Commensalism and amensalism

SECTION - C

13. Refer to the given structure X and answer the following questions.



X

(a) Identify the structure X and mention its significance.

(b) Identify the parts labelled as A, B, C and D in the given structure.

(c) How many light and heavy chains and antigen binding sites are present in X ?

(d) What is the percentage of X in total serum antibody?

OR

Carefully observe the given figure and answer the following questions.

(a) Identify the plant whose flowering branch is shown in the above given figure.

(b) Identify the plant part A and state its economic importance.

(c) Name the drugs that are obtained from this plant.

(d) What are the main effects of the drugs obtained from this plant?

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Solution

BIOLOGY - 044

Class 12 - Biology

1. Ascariasis is caused by a roundworm, *Ascaris lumbricoides*. It is an endoparasite of small intestine of human beings. Symptoms of ascariasis are abdominal discomfort, fever, anaemia. It is transmitted through contaminated food, water, vegetables etc.

OR

Certain cells when infected with virus, they produce cytokines such as interferon, which diffuse to healthy neighbouring cells and stimulates them to produce biochemicals, that block viral replication. When these cells become infected, the viruses are unable to take over the protein synthetic machinery to manufacture more of themselves and ultimately the spread of infection halts. This way cytokine barriers provide innate immunity in humans.

2. **(a)** Wine and beer are produced without distillation whereas whisky, brandy and rum are produced by distillation of fermented broth.

(b) Cyclosporin A is obtained from fungus *Trichoderma polysporum* whereas statin is obtained from yeast *Monascus purpureus*.

Cyclosporin A has immunosuppressive properties. It inhibits activation of T cells and therefore prevents rejection of transplants. Statin inhibits cholesterol synthesis and is therefore used in lowering blood cholesterol.

3. **(a)** The instrument shown is Gene gun.

The labelled parts are : (P) Firing pin, (Q) DNA coated pellets (R) Vent, (S) Stopping plate and (T) Target cells.

(b) Gene gun (or biolistic) method of gene transfer is a vectorless method of gene transfer in which tungsten or gold particles, coated with foreign DNA are bombarded into target cells at a very high velocity.

(c) This method is suitable and advantageous for introducing desired genes into plant cells. It is also used to insert gene into animals which promote tissue repair into cells, near wound.

It is also very useful in development of vaccine but could not be successful in treating genetic disorders.

OR

Restriction enzymes act within palindromic sequences. In the given DNA strand, point B shows a palindromic sequence. Thus, it can be a probable site of restriction enzyme action.

4. **(a)** X, Y and Z represent different age groups (male and female) found in a population. Here, X is post-reproductive, Y is reproductive group and Z is pre-reproductive group.

(b) Pyramid A is triangular age pyramid which represents expanding population. B is bell shaped age pyramid that represents stable population. C is urn shaped age pyramid representing declining population.

5. Palindromic nucleotide sequences are base pair sequences that are the same when read forward (left to right) or backward (right to left) from a central axis of symmetry.

This special sequence in the DNA is recognised by restriction endonuclease and once restriction endonuclease recognises this specific palindromic sequence, it binds to the DNA and cut the strand of DNA a little away from the centre of the palindrome sites but between the same two bases of the opposite strands. This leaves single stranded unpaired bases at cut ends. These ends with unpaired bases are called sticky ends or cohesive ends. The latter are named so because they form hydrogen bonds with their complementary cut counter parts. The sticky ends facilitate the action of the enzyme DNA ligase.

6. A nematode *Meloidogyne incognita* infects the roots of tobacco plants and causes a great reduction in yield. A novel strategy that was adopted to prevent this infestation was based on the process of RNA interference (RNA*i*), *i.e.*, silencing of gene expression using a dsRNA. It involves silencing of specific *m*RNA due to complementary dsRNA molecule that binds to

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and prevents translation of *m*RNA (silencing). Using *Agrobacterium* vectors, nematode-specific genes were introduced into the host plant (tobacco plant). The introduction of DNA was such that it produced both sense and anti-sense RNA in the host cells. These two RNAs being complementary to each other formed a dsRNA (double stranded RNA) that initiated RNAi and thus, silenced specific *m*RNA of the nematode.

7. Hypersensitive reaction to foreign substances is known as allergy. Substances which cause allergic reactions are called allergens. The common allergens are dust, pollen, feathers, paint. In allergic conditions, chemicals called histamine and serotonin are released from mast cells. Allergy can be avoided by reducing an exposure to allergen and by taking drugs like antihistamines, adrenaline and steroids.

8. Differences between on site and off site conservation are:

On site conservation		Off site conservation
(i)	It is conservation of endangered species in their natural habitats.	It is conservation of endangered species outside their natural habitats.
(ii)	The endangered species are protected from predators.	The endangered species are protested from all adverse factors.
(iii)	The depleting resources are augmented.	They are kept under human supervision and provided all the essentials.
(iv)	The population recovers in natural environment.	Offspring produced in captive breeding are released in natural habitat for acclimitisation.

9. **(a)** As per the given pie chart lichens are least in number, also lichens are pollution sensitive so with increasing globalisation we can assume that in near feature lichens will be subject to extinction and hence, may be considered as most endangered among the given taxas.

(b) Mosses and ferns grow in shady and humid places or wet places and need water for fertilisation. They also require high temperature and dry conditions and thus only a few of them survive. Hence, they are few in numbers.

(c) Fungi can live as saprotrophs or parasites. As saprotrophs, they depend on only organic matter and hence survive in any environment. They produce a number of thick walled spores, which can withstand the unfavourable conditions and germinate when conditions become favourable. This helps fungi in sustaining a large population.

(d) Angiosperms are the most advanced whereas fungi are the most primitive.

10. **(a)** Earlier insulin was extracted from pancreas of slaughtered cattle and pig. This insulin is not in use, as some diabetic patients developed allergic reaction to it.

(b) The difference between humulin (insulin synthesised by Eli Lilly) and insulin produced by the human pancreas is that humulin consists of two polypeptide chains (A and B) produced separately, extracted and combined by creating disulfide bond while insulin produced by human pancreas contains chains A, B and C and during maturation chain C is removed.

11. Presence of the insert (desired DNA or gene) within a gene coding for β-galactosidase results in insertional inactivation of the enzyme β-galactosidase, hence bacterial colonies do not produce any colour. This property is used as a selectable marker to differentiate between recombinants and non-recombinants. Therefore, bacterial colonies with cloning vector A are colourless as they are recombinants with the insert and bacterial colonies with cloning vector B are blue coloured as they are non-recombinants.

12. Herbivores feed on plants only, therefore for plants herbivores are predators. Similarly, carnivores are predators for herbivorous animals but the difference lies in the fact that while herbivores can run away from their predators, plants being immobile cannot run away from its predators.

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Therefore, plants have evolved a vast array of morphological features *e.g.*, thorns, spines and chemicals such as toxins, nicotine, caffeine, opium, quinine etc., as a means of defense against their predators. This prevents such plants from being targeted by their predators. Thus, the herbivores and the plants show a normal prey-predator relationship as in an ecosystem.

OR

(i) Differences between mutualism and parasitism are:

	Mutualism	Parasitism
1.	It is an association between two organisms in which both are benefitted.	It is an interaction between two living organisms of different species in which one organism called parasite obtains its food from another living organism called host, *i.e.*, one is benefitted and other is harmed.
2.	Nitrogen fixing blue-green alga or cyanobacterium called *Anabaena* is associated with water fern *Azolla* in a mutualistic interaction.	*E.g., Cuscuta* is a total stem parasite, malarial parasite is found intracellulary (endoparasite) etc.

(ii) Differences between commensalism and amensalism are:

	Commensalism	Amensalism
1.	In this interaction one species gets benefitted and the other is neither harmed nor benefited.	In this interaction one species is harmed whereas the other is unaffected.
2.	For example, the pilot fish (*Naucrates ductor*) always accompanies shark and feeds upon the falling pieces of food when shark is eating the prey. The shark does not get any benefit from this association.	For example, *Penicillium* does not allow the growth of *Staphylococcus* bacterium. Inhibition is achieved through the secretion of chemicals called allochemics.

13. (a) IgA. It is the second most abundant class of antibody after IgG. It provides localised protection in external secretions against bacteria and viruses.

(b) A – J-Chain; B – Fab region (Fragment antigen binding); C – Secretory Component; D – Fc region (Fragment crystallisable)

(c) IgA being a dimer have four heavy chains and four light chains. Therefore, it has four antigen binding sites.

(d) IgA constitutes 10-15% of total antibodies present in serum.

OR

(a) *Papaver somniferum*

(b) The plant part A is identified as the capsule. Afeem (opium) is dried latex that is obtained from this unripe fruit (capsule) of poppy plant.

(c) The drugs obtained from opium are – morphine, codeine, heroin, methadone, etc.

(d) The drugs obtained from opium mainly act as analgesic (pain-killer) because they relieve pain by binding to specific receptors in central nervous system of the body.

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