

SOLUTIONS MODEL QUESTION PAPER-I (TERM-II) 2021-22
CLASS-12TH SUBJECT-BIOLOGY

SECTION – A

1. Thymus is the primary lymphoid organ. In thymus gland, immature lymphocytes differentiate into antigen-sensitive lymphocytes. If thymus gland is removed from the body of a person, his immune system becomes weak. As a result the person's body becomes prone to infectious disease. [2 Marks]
2. The microbe is fungi and scientific name is *Aspergillus niger*. [1 + 1 = 2 Marks]

OR

Flocs – These aerobic microbes consume the major part of the organic matter in the effluent. This significantly reduces BOD of the effluent.

Activated sludge – A small part of activated sludge is used as inoculum and pumped back to aeration tank / pumped into anaerobic sludge digesters where microbes or bacteria grow anaerobically to produce CH_4 or H_2S or CO_2 or biogas. [1 + 1 = 2 Marks]

3. The disease is ringworm. It causes by fungi of genera such as *Microsporium*, *Trichophyton* and *Epidermophyton*.
Human infection occurs either through contact with an infected person or from soil. It also spreads through towels, clothes, combs, etc., of the infected persons. [1 + 1 = 2 Marks]
4. (a) (A)- Lactic acid, (B) increased vitamin B_{12} (b) Lactic acid bacteria [1 + 1 = 2 Marks]
5. (a) The line A represent conformers,
It is because majority (99%) of animals and nearly all plants cannot maintain a constant internal environment, their body temperature is determined by ambient temperature. The osmotic concentration of the body fluids change with that of the ambient water osmotic concentration, such animals and plants are simply called conformers.
(b) The other line represent regulators, Some organism maintained homeostasis by physiological and behavioural means, such organism are called regulators. All birds and mammals and few lower vertebrates and invertebrate species maintained homeostasis by thermoregulation and osmoregulation. [1 + 1 = 2 Marks]
6. According to Allen's rule, mammals in colder climate have shorter ears and shorter limbs to minimize heat loss. Small animals like humming birds have a large surface area relative to their volume. So they tend to lose body heat very fast when it is cold outside. Then, these animals have to use their energy (generated by metabolic reactions) to generate body heat. That is the reason why small sized animals are rarely found in the polar regions. [2 Marks]

OR

Besides acting as 'conduits' for energy transfer across trophic levels, predators play other important roles:

- They keep prey population under control
- They naturally reduce interspecific competition and do not harm the useful organism.

Predators also help in maintaining species diversity in a community by reducing the intensity of competition among competing prey species. [2 Marks]

SECTION-B

7. (a) Tetanus antitoxins / Tetanus toxoid
 (b) The preformed antibody injected act on the pathogen immediately to provide protection.
 (c) This injection was given against tetanus and it provides passive immunity. [1 + 1 + 1 = 3 Marks]

OR

- (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.
 (b) Active immunity.
 (c) 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) it destroys tumour. [1 + 1 + 1 = 3 Marks]
8. (a) Taking smack is considered as abuse because it is highly addictive. It is a depressant and slow down body functions. It causes psychological and physical dependence.
 (b) Its chemical name is diacetylmorphine and is obtained from poppy plant, *Papaver somniferum*.
 (c) Drugs taken intravenously (direct injection into the vein using a needle and syringe) are much likely to acquire serious infections like AIDS and hepatitis B. The viruses, which are responsible for these diseases are transferred from one person to another by sharing infected needle and syringes. [1 + 1 + 1 = 3 Marks]
9. (a) A cloning vector must have the following characteristics:
 It should have ori/origin of replication
 It has selectable marker genes, like encoding for an antibiotic resistance / genes for encoding for galactosidase.
 It has cloning site /recognition site, for the restriction enzyme to recognize.
 (b) The DNA is a hydrophilic molecules so, it cannot pass through cell membrane. Bacterial cell is made competent by treating with lysozyme specific concentration of Ca^{++} (divalent ions) incubating them on ice, heat shock for a short period and placing it back on ice again. [1½ + 1½ = 3 Marks]

10. (a) It differ from previous episodes due to rate if its extinction. The current species extinction rate are estimated near 100 to 1000 more faster than in the pre human time.
(b) Human activities
(c) Reforestation, Sustainable utilization of resources, ex-situ and in-situ conservation of biodiversity. **[1 + 1 + 1 = 3 Marks]**
11. (a) Alexander von Humboldt. He observed that within a region, species richness increased with increasing explored area but only up to a limit.
(b) (i) The slopes regression lines are similar when unaffected distribution in an area in analysed.
(ii) The slope of regression is steeper when we analysed the species area relationship among very large areas like entire continent The 'Z' (slope of the line) is the regression co-efficient
(c) It species richness is more i.e. in the range of 0.6 to 1.2. **[1 + 1 + 1 = 3 Marks]**
12. (a) *Escherichia coli*.
(b) Origin if replication or 'ori' controls copy numbers of inserted gene.
(c) The selectable markers are *amp^R* and *tet^R*. Selectable markers help to select the host cells which contain the vector (tranformants) and eliminate the non transformants.

SECTION C

13. (a) Selectable markers are essential to identify and eliminate non-transformants, by selectively permitting the growth of the transformants.
(b) Bam HI site will affect tetracycline antibiotic resistance gene, hence the recombinant plasmids will lose tetracycline resistance due to inactivation of the resistance gene. Recombinants can be selected from non-recombinant by plating into a medium containing tetracycline, as the recombinant will not grow in the medium because the tetracycline resistance gene is cut.
(c) In insertional inactivation method, the presence of a chromogenic substrate gives blue coloured colonies in absence of an insert. Presence of an insert in the enzyme site does not produce colour. Selection of recombinant due to inactivation of antibiotics is a cumbersome procedure because it required simultaneous plating on two plates having different antibiotics. Therefore, selectable markers are preferred for selection of recombinants.
(d) When a recombinant DNA is inserted within the coding sequence of the enzyme β -galactosidase, it result into inactivation of the enzyme. The presence of a chromogenic substrate give blue coloured colonies if the plasmid in the bacteria does not have an insert, whereas presence of insert do not produce any colour. **[1½ + 1½ + 1½ + 1½ = 5 Marks]**

OR

- (a) Adenosine deaminase (ADA) deficiency.
- (b) (In Enzyme Replacement Therapy) functional ADA is introduced to the patient (by injection), this therapy is not completely curative / enzyme can act only for a limited time period.
- (c) It caused due to deletion of the gene for adenosine deaminase.
- (d) Introduction of genetically engineered lymphocytes in to sch type of patient is not a permanent cure because these cells are not immortal and the patient required periodic infusion of such genetically engineered lymphocytes. A possible permanent cure can be isolating the gene producing adenosine deaminase (ADA) from bone marrow cells and introducing it into cells at early embryonic stage. **[1½ + 1½ + 1½ + 1½ = 5 Marks]**