

INDIAN SCHOOL NIZWA

CLASS: XIIB BIOLOGY CH-10 BIOTECHNOLOGY – APPLICATIONS- WORK SHEET

1. Bt cotton is not: a. A GM plant b. Insect resistant c. A bacterial gene expressing system d. Resistant to all pesticides
 2. C-peptide of human insulin is: a. A part of mature insulin molecule b. Responsible for formation of disulphide bridges c. Removed during maturation of pro-insulin to insulin d. Responsible for its biological activity.
 3. GEAC stands for: a. Genome Engineering Action Committee b. Ground Environment Action Committee c. Genetic Engineering Approval Committee d. Genetic and Environment Approval committee
 4. α -1 antitrypsin is: a. An antacid b. An enzyme c. Used to treat arthritis d. Used to treat emphysema
 5. A probe which is a molecule used to locate homologous sequences in a mixture of DNA or RNA molecules could be: a. A ssRNA b. A ssDNA c. Either RNA or DNA d. Can be ssDNA but not ssRNA
 6. Choose the correct option regarding Retrovirus: a. An RNA virus that synthesises DNA during infection b. A DNA virus that synthesises RNA during infection c. A ssDNA virus d. A dsRNA virus
 7. The site of production of ADA in the body is: a. Erythrocytes b. Lymphocytes c. Blood plasma d. Osteocytes
 8. A protoxin is: a. A primitive toxin b. A denatured toxin c. Toxin produced by protozoa d. Inactive toxin
 9. Pathophysiology is the: a. Study of physiology of pathogen b. Study of normal physiology of host c. Study of altered physiology of host d. None of the above
 10. The trigger for activation of toxin of *Bacillus thuringiensis* is: a. Acidic pH of stomach b. High temperature c. Alkaline pH of gut d. Mechanical action in the insect gut
 11. Golden rice is: a. A variety of rice grown along the yellow river in China b. Long stored rice having yellow colour tint c. A transgenic rice having gene for β - carotene d. Wild variety of rice with yellow-coloured grains.
 12. In RNAi, genes are silenced using: a. ss DNA b. ds DNA c. ds RNA d. ss RNA
 13. The first clinical gene therapy was done for the treatment of: a. AIDS b. Cancer c. Cystic fibrosis d. SCID (Severe Combined Immuno Deficiency resulting from deficiency of ADA)
 14. ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of ADA? a. Adenosine deoxyaminase
 15. Silencing of a gene could be achieved through the use of: a. RNAi only b. antisense RNA only c. both RNAi and antisense RNA d. none of the above
1. Can a disease be detected before its symptoms appear? Explain the principle involved.
 2. Write a short note on Biopiracy highlighting the exploitation of developing countries by the developed countries.
 3. Many proteins are secreted in their inactive form. This is also true of many toxic proteins produced by micro organisms. Explain how the mechanism is useful for the organism producing the toxin
 4. While creating genetically modified organisms, genetic barriers are not respected. How can this be dangerous in the long run?
 5. Why has the Indian Parliament cleared the second amendment of the country's patents bill?

6. Give any two reasons why the patent on Basmati should not have gone to an American Company.
7. How was Insulin obtained before the advent of rDNA technology? What were the problems encountered?
8. With respect to understanding diseases, discuss the importance of transgenic animal models.
9. Name the first transgenic cow. Which gene was introduced in this cow?
10. ELISA technique is based on the principles of antigen-antibody interaction. Can this technique be used in the molecular diagnosis of a genetic disorder, such as phenylketonuria?
11. How is a mature, functional insulin hormone different from its prohormone form?
12. Gene therapy is an attempt to correct a genetic defect by providing a normal gene into the individual. By this the normal function can be restored. An alternate method would be to provide the gene product (protein/enzyme) known as enzyme replacement therapy, which would also restore the function. Which in your opinion is a better option? Give reason for your answer.
13. Transgenic animals are the animals in which a foreign gene is expressed. Such animals can be used to study the fundamental biological process, phenomenon as well as for producing products useful for mankind. Give one example for each type.
14. When a foreign DNA is introduced into an organism, how is it maintained in the host and how is it transferred to the progeny of the organism?
15. Bt cotton is resistant to pest, such as lepidopteron, dipterans and coleopterans. Is Bt cotton also resistant to other pests as well?
16. List the disadvantages of insulin obtained from the pancreas of slaughtered cows and pigs.
List the advantages of recombinant insulin.
17. What is meant by the term bio-pesticide? Name and explain the mode of action of a popular bio-pesticide
18. Papaya is a widely cultivated crop in several regions. However, its production was limited by papaya ringspot disease which is caused by the Papaya ringspot virus (PRSV). Papaya plants infected by PRSV show symptoms of yellowing, discolouration of leaves and 'ringspots' on the fruit. PRSV belongs to the genus Potyvirus which has a single-stranded RNA as its genetic material.
(a) Explain the step-by-step process to inhibit the viral RNA from surviving in the papaya plants thus creating disease-resistance varieties of papaya.
(b) Name the biotechnological process described in (a) and give a reason why it is the appropriate process to be used in this case.
19. Growth hormone injection treatment is prescribed for children who have been diagnosed with growth hormone (GH) deficiency and other conditions causing short stature and insufficient growth. This hormone is produced by the pituitary gland in humans so the gene for this hormone was isolated from the pituitary gland and introduced into phGH407 vectors for production. However, a problem with this was that the protein so produced was 26 amino acids longer than the active growth hormone (24 amino acids long) and so this method could not be used.
(a) Given that the amino acid sequence of the active growth hormone was known, use a diagram to explain how human growth hormone could be produced outside the body.
(b) The vector consists of a *lac* gene which codes for the enzyme β -galactosidase. Describe how this gene can help with the selection of colonies containing the transgene

Answers of Q 18 & 19

18. Ans (a) 0.5 marks each for the following: -

The viral RNA is isolated and converted to a dsDNA structure. –

The dsDNA so formed is inserted into an appropriate vector (*Agrobacterium* or viral vector).

-The vectors are then introduced into the host plant where it transcribes the mRNA for this gene. - Whenever the virus infects the plant and injects its RNA into the host plant, the host plant transcribes the viral RNA.

-The mRNA produced from the vector binds to the transcribed viral RNA. - This prevents the viral RNA from being transcribed and therefore survives in the host plant without infecting the plant.

(b) 1 mark each for the following: - RNAi or RNA interference - RNAi helps in in-vitro silencing of a gene/set of genes so that they lose their function.

19. (a) 1 mark each for each of the following step explained in a diagram: - From the amino acid sequence, the gene for growth hormone needs to be synthesized chemically.

- The gene of interest is cut using a restriction enzyme and the same restriction enzyme is used to cut the vector within the *lac* gene.

- The gene obtained is inserted into the vector using a ligase.

- These are transformed into *E.coli* cells/host cells for production.

(b) 0.5 marks each for the following: - In recombinants, since the *lac* gene is inactivated, after insertion of the gene of interest, it does not produce the β -galactosidase enzyme which results in colourless colonies when a chromogenic substrate is added.

- In non-recombinants, since the *lac* gene is still active, it produced the enzyme β -galactosidase which results in blue colonies when a chromogenic substrate is added.