Ref. No. Ex/SC/BT/PG/Core/TH/334/2023

M. Sc. (Biotechnology) Examination, 2023

(2nd Year, 1st Smester)

Subject : Animal and Development Biotechnology

Paper : MSBT 334

Time : Four hours Full Marks : 80

PART A

Answer any four questions :

1. What are the disadvantages of killed or inactivated vaccines? Give one example of viral glycoprotein which is used as subunit vaccine. What is the immunological advantage of using polysaccharide vaccine conjugated with protein carrier? How Can *Shigella* Be used as Vaccine-vectors. Mention the advantage of using **Lactobacillus**-genus as oral or intranasal vaccine delivery system. (2+1+2+2+3)
2. Outline the steps involved in Fluorescence in situ hybridization. How Primed in situ labeling (PRINS) technique can be used for **sequence specific in situ detection of DNA.** What is the principle of CGH? What is microarray comparative genomic hybridization? (3+2+2+3)
3. Explain cVNT, pVNT and sVNT test for the detection of Covid-19 infection. How mutation at different sites of a gene can be detected? How DNA chip works? (5+3+2)
4. Mention the novelty of *Clostridial Spores* in cancer therapy. Mention the strategy to develop therapeutic agents against Cystic fibrosis using alginate lyase. How neutralizing antiviral antibodies (nAbs) can be isolated by phage display technique? (2+4+4)
5. Give the mechanisms of action of PROteolysis-TArgeting Chimeras (PROTACs) for degrading target proteins. What do you understand by bispecific T-cell engager (BiTE)? Name the different bispecific antibody molecules you can generate. How antibody molecule can be delivered inside cells. (3+2+3+2)
6. How embryonic stem cells can be used to produce transgenic animals? How you identify transgenic cells? Why transgenic mouse model for human diseases are popular? What are the characteristics features of HIVAN mouse? (2+4+2+2)

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7. What is the importance of **Inducible transgenic** mouse models? Mention the features of **r**everse **t**etracycline-controlled **trans**activator (rtTA).How using CRE-LOX system any gene can be induced in transgenic animals?

(2+3+5)

8. What are the critical biological considerations that must be followed before gene therapy? What is the crippled human immunodeficiency virus (HIV)? Mention the features of Pseudotype virus? Mention the strategy of using Herplex simplex virus (HSV) as gene delivery agents. (2+2+3+3)

GROUP B

Answer any TWO questions from Question No. 1-5 (20 x 2=40)

9. (A) What are compaction and hatching during the development of an embryo? (3)
   (B) What would happen if dorsal lip of blastopore of Newt is transplanted to the presumptive ventral epidermis of developing embryo? (5)
   (C) What are instructive and permissive interaction? Explain the phenomenon with proper example. (4)
   (D) What is homeotic selector gene? Name the two complexes along with the associated homeotic selector gene presents in Drosophila embryo. What will be the consequence of loss- and gain- of function mutants of *ultrabithorax (ubx)* in Drosophila embryo? (2+3+3=8)

10. (A) "Hensen's node" is known as the avian equivalent of amphibian dorsal blastopore lip" Justify the statement with proper experiment. (6)
   (B) What would be the effect of calcium ionophore and acidic pH on acrosomal exocytosis?(4)
   (C) What are the signaling events that might take place during the dorso-ventral axis formation of Drosophila embryo deficient in maternal *"Gurken"*? (6)
   (D) What is the significance of regression of primitive streak? (4)

11. (A) Describe involution and delamination types of morphogenetic movement during gastrulation. (5)
   (B) What are the functions of cortical granules during the process of fertilization? (4)
   (C) What is the molecular mechanism that determines the left/right patterning during chick embryonic development? (6)
   (D) How would low sodium concentration in the extracellular space affect polyspermy? If we were able to observe cleavage under microscope, what changes would we expect to see during cleavage if polyspermy occurred? (3+2=5)

12. (A) Explain different steps during Sea Urchin fertilization. (3)
   (B) How will you experimentally show the absolute requirements of ZP3 protein in binding reaction between egg and sperm? (3)
   (C) What will happen if *wingless* RNAi is expressed in wingless expressing cells from the stage when this gene initiates is expression in a Drosophila embryo? (4)
   (D) What do you understand by cell commitment to a particular fate during development?(6)
   (E) Name any two extraembryonic structures in mammals with their respective functions. (4)

13. (A). What are iPS cells and how are they generated? (4)
   (B). Explain how would you use iPS cells therapeutically to treat type I diabetes? (6)
   (C) What are primary and secondary neurulation during development? (6)
   (D) If N-cadherin mRNA is injected into the neural ectoderm of frog embryo, what would happen to the developing embryo? (4)