KATHMANDU UNIVERSITY
End Semester Examination
February/March 2018

Marks Scored:

Level : B.Tech.
Year : IV

Course : BIOT 409
Semester: I

Exam Roll No.:

Time: 30 mins.

F.M. : 20

Registration No.:

Date MAR 1 8 2018

SECTION "A"
[10 Q. × 1 = 10 marks]

Choose the correct answer.

1. Which of the choices shown below correctly completes the following statement? Minor histocompatibility antigens are:
   [ ] Critical targets during hyperacute rejection of organ allografts
   [ ] Of no consequence in allograft rejection
   [ ] Recognized as polymorphic donor peptides associated with self-MHC antigens
   [ ] Encoded by genes located within the MHC

2. Regarding anaphylactic (type I) and immune complex (type III) hypersensitivities, which of the following is the MOST accurate?
   [ ] IgE is involved in both anaphylactic and immune complex hypersensitivibes
   [ ] Complement is involved in both anaphylactic and immune complex hypersensitivities
   [ ] Less antigen is typically needed to trigger an anaphylactic reaction than an immune complex reaction
   [ ] Neutrophils play more important role in anaphylactic reactions than in immune complex reactions

3. An important indicator of how the immune system is functioning and how advanced the AIDS infection is
   [ ] the number of helper T cells
   [ ] the number of killer B cells
   [ ] the number of helper B cells
   [ ] the number of macrophages

4. Attempts were made to treat patients with plasma cell myeloma with anti-IL-6 because IL-6 functions as an autocrine stimulator of the malignant plasma cells. These efforts were discontinued due to the side effects of the treatment, including proliferation of mesangial cells of the kidney. This phenomenon is an example of which of the following?
   [ ] the redundancy of cytokine function
   [ ] renal toxicity of the drug
   [ ] cross-reactivity of anti-IL-6 with molecules in kidney cells
   [ ] the pleiotropic nature of cytokine function

5. A 25-year-old man was stung by a bee and had no reaction. The second time he was stung, 6 months later, he had local swelling immediately. This same man is stung a third time and goes into anaphylactic shock. This severe reaction is due to which of the following?

[ ] a breakdown in tolerance.
[ ] cross-reactivity of bee venom with bacterial antigens
[ ] the higher titers of venom-specific IgE now present in this patient
[ ] the attenuation of the IgG levels in the time elapsed between challenges

6. The high concordance rate for monozygotic vs dizygotic twins in type 1 diabetes indicates

[ ] a strong environmental element [ ] a strong genetic element
[ ] the influence of HLA [ ] that microbial infection cannot be involved

7. The majority of licensed vaccines today consist of all but which of the following antigenic preparations?

[ ] Live, attenuated bacteria or viruses
[ ] Acellular antigens derived from bacteria or viruses
[ ] Active toxins derived from bacteria
[ ] Acellular antigens derived from bacteria or viruses

8. Why is serotyping used?

[ ] to identify, classify, and subgroup certain bacteria into categories
[ ] to identify and diagnose disease
[ ] to verify the presence of specific antibodies that react with specific antigens
[ ] to identify persons of the same blood type

9. Cancer cells often have reduced amounts of cell surface proteins, including class I MHC antigens. Which of the following cells of the immune system can exploit this property to kill cancer cells?

[ ] Natural Killer Cells [ ] Macrophages
[ ] Cytotoxic T cells [ ] Helper T cells

10. The affinity of an antibody can be determined by measuring:

[ ] Its concentration.
[ ] The valency of antigen binding
[ ] The amount of antibody bound at various antigen concentrations.
[ ] Its ability to neutralize bacterial toxins.

SECTION "B"

[5Q. × 1 = 5 marks]

Fill in the blanks.

11. Indirect ELISA quantifies the amount of _____ present in the sample,

12. The primary types of cells that operate in surveillance and destruction of tumor cells are cytotoxic T cells, NK cells and _____.

13. When a hapten-carrier complex containing multiple hapten molecules is injected into an animal, most of the induced antibodies are specific for _____.

14. Transfusion reactions are the manifestations of type _____ hypersensitivity.

15. Attenuated vaccines are more likely to activate _____ immunity.

SECTION "C"

[5Q. × 1 = 5 marks]

Define the following:

16. DNA vaccine::

17. Passenger leukocytes:

18. Primary immunodeficiency:

19. Sequestered antigens:

20. Anti-idiotypic antibody:

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SECTION "D"

Attempt *ALL* questions

1.a) Cytokine therapy is a promising yet difficult to develop immunotherapy Explain. [3]

b) How does the non specificity of cytokine reconcile with the specificity of our immune system? [2]

2.a) You have a myeloma protein, X, whose isotype is unknown and several other myeloma proteins of all known isotypes (e.g., IgG, IgM, IgA, and IgE). [3]
i. How could you produce isotype-specific antibodies that could be used to determine the isotype of myeloma protein X?
ii. How could you use this anti-isotype antibody to measure the level of myeloma protein X in normal serum?

b) You are given two solutions, one containing protein X and the other containing antibody to protein X. When you add 1 ml of anti-X to 1 ml of protein X, a precipitate forms. But when you dilute the antibody solution 100-fold and then mix 1 ml of the diluted anti-X with 1 ml of protein X, no precipitate forms. [2]
i. Explain why no precipitate formed with the diluted antibody.
ii. Which species (protein X or anti-X) would likely be present in the supernatant of the antibody-antigen mixture in each case?

3.a) Explain any three mechanisms that account for the decrease in the numbers of CD4 T cells in HIV-infected individuals. [3]

b) Which vaccine (attenuated or killed) would you recommend for HIV-infected children? Explain the basis for your answer. [2]

4.a) Write short note on Graft vs Host disease [3]

b) Why is cornea graft accepted more readily than kidney graft? [2]

5.a) Discuss the role of viruses in triggering autoimmune reaction. [3]

b) Why are women more prone to autoimmune disorders than men? [2]

6.a) Explain the relation between type IV hypersensitivity and graft rejection. [3]

b) Serum sickness can result when an individual is given a large dose of antiserum such as a mouse antitoxin to snake venom. How could you take advantage of recent technological advances to produce an antitoxin that would not produce serum sickness in patients who receive it? [2]

7.a) Explain the relationship between the incubation period of a pathogen and the approach needed to achieve effective active immunization. [3]

b) You have identified a bacterial protein antigen that confers protective immunity to a pathogenic bacterium and have cloned the gene that encodes it. The choices are either to express the protein in yeast and use this recombinant protein as a vaccine, or to use the gene for the protein to prepare a DNA vaccine. Which approach would you take and why? [2]

8.a) Write short note on "Monoclonal antibodies for cancer immunotherapy". [3]

b) Explain immune surveillance theory for cancer. [2]

9.a) A young girl who had never been immunized to tetanus stepped on a rusty nail and got a deep puncture wound. The doctor cleaned out the wound and gave the child an injection of tetanus antitoxin [3]

i. Why was antitoxin given instead of a booster shot of tetanus toxoid?
ii. If the girl receives no further treatment and steps on a rusty nail again 3 years later, will she be immune to tetanus?

b) You prepare an immunotoxin by conjugating diphtheria toxin with a monoclonal antibody specific for a tumor antigen.

i. If this immunotoxin is injected into an animal, will any normal cells be killed?
ii. If the antibody part of the immunotoxin is degraded so that the toxin is released, will normal cells be killed? Explain. [2]

10. Give *TWO* MAJOR differences between the following [5 × 2=10]

i. Cytokines and Hormones
ii. Hyperacute and Acute graft rejection
iii. Immunosuppression and Immunodeficiency
iv. Humoral and Cell mediated hypersensitivity
v. Precipitation and Agglutination